COMPUTERWORLD

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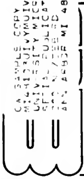

Looks at DDP

Fairchild's Net Reaches Abroad

By Esther Surden
CW Staff

MOUNTAIN VIEW, Calif. — Fairchild Camera & Instrument Co. is implementing an ambitious international distributed DP (DDP) network under careful control of its management information systems (MIS) department here.

Planning and control are essential in implementing a DDP net, according to Burleigh Cook, MIS director, who describes his distributed environment as "operating in a network with an overall system plan." Such a plan makes the difference between "putting minis out there and telling the people to program" and knowing exactly what's in the field, what costs are involved, what each system must do and what programming is needed, he said.

'Distributed Processing: Buzzword or Byword?', a CW Special Report, follows Page 44.

The Fairchild network of minis is replacing a variety of time-sharing services and computer gear operating in various applications. The firm uses Computer Automation, Inc. Syfa systems as the remote minis in the net, Cook said.

The first overseas implementation — in Singapore early last year — was a shipping application, most of which formerly ran on a time-sharing-option-oriented interactive terminal.

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IN DEPTH
IN DEPTH
IN DEPTH

It's time to jettison some of those pervasive but false beliefs about software, Werner L. Frank believes. See 'The Ten Great Software Myths,' starting this week on Page 13.

To Aid DP Competitors

U.S. May Ask IBM Relief Now

By Edith Holmes
CW Washington Bureau

WASHINGTON, D.C. — The Justice Department will decide "soon" whether to ask for interim relief when it finishes presenting its antitrust case against IBM, Assistant Attorney General John H. Shenefield said at a trade association meeting here last week.

The head of the department's Antitrust Division declined to tell the members of the Computer & Communications Industry Association (CCIA) at its Fifth Annual Caucus here just what form of relief the government plans to propose in the middle of the nearly three-year-old trial.

Interim relief would exact some price from IBM for its alleged monopoly practices before the corporation presents its defense to Judge David E. Edelstein. It would not mean that IBM is guilty of monopolizing the industry, and it would be reversed should IBM win the suit, according to A.G.W. (Jack) Biddle, executive director of the CCIA.

Relief of the industry might mean the court would require IBM to make interface specifications of new products available to competitors when they are announced or to make its installed base public by product and country on a quarterly basis to allow an accurate census of the industry to be made, Biddle suggested.

Risk of Delay

The Justice Department must determine whether the law is sufficiently clear to allow it to proceed with interim relief proposals, Shenefield said. In addition to deciding what kind of relief it will request, the Justice Department's Antitrust Division must also decide whether it wants to risk the nine-month to one-year delay in the trial that such proposals would mean.

"An interim relief hearing would probably be held, and the resulting delay in the trial is a cost I'm very concerned about," the antitrust chief stated.

Shenefield praised Sen. Edward M. Kennedy (D-Mass.) for his support of interim relief in U.S. vs. IBM, expressed during the senator's keynote address to the CCIA meeting (see related story on Page 6). Calling Kennedy's statement "courageous," the Assistant Attorney General said he was "delighted" to read the speech and found it very reassuring that a generally unpopular arm of the Justice Department would receive such strong congressional backing.

CW Photo by E. Holmes

Sen. Edward M. Kennedy, chairman of the Senate Antitrust and Monopoly Subcommittee, last week called the three-year-old U.S. vs. IBM antitrust trial a "sideshow" and endorsed the recommendation that the Justice Department seek interim relief in the case. Story, Page 6.

Addressing the belief in some quarters that the Justice Department favors settling the U.S. vs. IBM and U.S. vs. AT&T suits by some form of congressional action, Shenefield said "there will be no half-baked settlements or motions for a change of venue to Capitol Hill.

"It is no secret that we see the AT&T case as an opportunity to work out the lessons of the IBM suit, as a chance for the Antitrust Division and the courts to demonstrate that with a little hard work and common sense a very big, very significant antitrust case can be tried successfully in less than a lifetime," he said.

"We are trying very hard to produce a fine-tuned discovery effort that will

(Continued on Page 6)

DEC Introduces Mainframe Packaged as Small System

By Esther Surden
CW Staff

NEW YORK — A system that is small, doesn't require a computer room or special power considerations is a minicomputer, right? Wrong.

Digital Equipment Corp. last week introduced a mainframe in minicomputer clothes. Called the Decsystem-2020, the system extends the firm's mainframe line down into the IBM 370/115 range.

At the same time, DEC introduced the Decsystem-2060, a system that expands the capability of the firm's 2050 to handle up to 4M bytes of MOS memory and 80 concurrent jobs. The 2060 was described by the vendor as being in the range of IBM's 370/148 and 158 systems.

The highlight of the Decsystem-2020 is its packaging and architecture, which borrow many features from minicomputers, according to a spokesman.

For example, the system is housed in a five-foot-high, three-foot-wide and two-foot-deep cabinet. It reportedly runs on ordinary 110V power and uses about the same amount of power as a portable hair dryer.

The Decsystem-2020 is software-compatible with other members of the firm's 20 line so it can run programs written on the larger models, he emphasized. In addition to DEC's Tops-20 operating software, Tops-10 software designed for the firm's Decsystem-10 series can also be accommodated by the system.

(Continued on Page 4)

IBM Holding 138, 148 Sale

WHITE PLAINS, N.Y. — Purchase prices for the IBM 370/138 and 370/148 CPUs were reduced by as much as 20% last week as IBM sought to bring those systems' prices "more in line" with those of the current 30 series, a spokesman said.

Also affected by price cuts were some features common to the 138 and 148 systems as well as the 135 and 145.

A 370/138 with 512K bytes of main memory that formerly cost $350,000 now costs $278,600. A 1M-byte Model 138 previously cost $405,000 and now is priced at $333,600.

The 370/148 with 1M byte of memory now costs $548,450 compared with the previous $689,000. A 2M-byte 148 formerly priced at $799,000 now costs $658,450.

The price reductions brought the cost of a "typically configured" system down by 17%, the spokesman noted. For example, a 370/138 Model J with 1M byte of memory, integrated communications adapter, integrated 3203 printer attachment, second and third communications adapters, 3330/3340 integrated file adapter, power unit and 3287 Model 2 console printer now costs $405,330 compared with the previous price of $492,040.

A 2M-byte Model 145 configured

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HIS Protests Bid Process

System for Mass. Courts Hits Snag

By Ann Dooley
And Brad Schultz
CW Staff

BOSTON — A dispute over alleged procurement errors has stalled an attempt to give the Massachusetts Supreme Judicial Court (SJC) a statewide Court Case Management Information System (CCMIS) — an implementation of the Prosecutor's Management Information System (Promis) designed to break judicial "logjams."

Honeywell Information Systems, Inc., is protesting the SJC's acceptance, in November, of Burroughs Corp.'s $815,000 bid to install the Promis package, using its hardware and systems software to create CCMIS.

An evaluation team from the court DP center had rejected HIS's runner-up $1.2 million bid as well as those of CMC Associates, Data General Corp., Digital Equipment Corp., Harris Corp., IBM, Prime Computer, Inc. and Univac.

The Institute for Law and Social Research (Inslaw) in Washington, D.C., will go ahead with its plan to send the court a Promis package as soon as the equipment needed for implementation becomes available, Inslaw director Bill Hamilton has confirmed.

First State Installation

To date, Promis installations have been county court operations whose software, developed by Inslaw, was modified and transferred from site to site. SJC personnel inspected a Promis installation in Milwaukee, Wis., last May before deciding to transfer the system to Massachusetts.

The Mass. Committee on Criminal Justice (CCJ) Proposal Review Board has begun informal hearings into the matter, addressing two issues: whether the bids were evaluated fairly in "open and free" competition, and whether Burrough's winning bid truly responded to the court's request for proposal (RFP) of June 22.

The hearings have had much of the drama of a courtroom trial as SJC counsel Robert Bigelow squared off with CCJ general counsel John L. Tobin. Witnesses have been examined and cross-examined, and evidence has been accumulated and referenced.

Tobin is trying to prove that after accepting bids, the SJC DP center altered its CCMIS specifications in a "clarification" stage of the procurement process so that HIS was misinformed about what the center wanted and therefore ran handicapped in the bid competition.

HIS contends that the clarification was not open to the public and that Burroughs gained the inside track by modifying a bid that originally was not responsive to the specifications and that the bid only became acceptable after that point.

Tobin has charged the SJC Executive Office with failing "to engage in open and free competition in accordance with applicable minimum federal standards," but cautiously added, "there has been no suggestion of fraud or wrongdoing, but only a failure to observe requirements of competitive bidding."

HIS Participation

An HIS contingent has actively participated in the deliberations, securing and using presiding officer Barbara Clurman's permission to cross-examine with the benefit of an HIS attorney.

Though Burroughs people have also been present, the firm has not been represented by counsel and is in the position of having much to lose in the dispute without being a "named party." The dispute is technically between Tobin, representing CCJ in response to the HIS protest, and Bigelow, representing the court.

Bigelow noted that Massachusetts Attorney General Francis X. Bellotti disqualified his office from participation in the imbroglio, avoiding possible "conflict of interest" because Burroughs had previously furnished his office with equipment and an assistant attorney general previously served on the CCJ Review Board.

Burroughs people seemed concerned about the propriety of the hearings since Tobin, "the prosecutor," and Clurman, "the judge," work for CCJ. CCJ oversees the dispersement of all Law Enforcement Assistance Administration (LEAA) funds to the state. LEAA grants are financing the CCMIS project.

The hearings began last week with testimony from two key witnesses: the executive secretary of SJC, John A. Fiske, and the director of SJC's DP center, Robert K. Mitchell.

HIS branch manager John D. Borgman had written a formal letter of protest to Fiske last December. Among the "grounds for protest and complaint" cited in Borgman's letter were:

- Fiske's office had held no public opening of the responses to its request for clarification of bids last September.
- Burroughs' successful response to the RFP, based on its B1800 series hardware, "does not meet the mandatory specifications and requirements of the RFP in several respects and is therefore nonresponsive."
- Mitchell's evaluation team improperly allowed modifications of some bids, inciting an earlier HIS protest.

On the second of these points, Borgman's letter claimed that Burroughs' products were nonresponsive because they failed to meet the requirements for Ansi 1974 Cobol; testing, debugging and compilation; point-to-point terminal communication; and maximum growth potential.

Fiske noted in his testimony that there had been no requirement during the procurement procedure for a written statement of procurement policy, and this was corroborated later by Mitchell's testimony.

Mitchell testified that HIS had not been responsive to the RFP specifications; for example, HIS was said to have improperly expressed the pricing of certain modem equipment.

Representatives from DEC, Prime and Univac — among the vendors that had lost the bid competition — were present when the hearings began.

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DEC Unveils Minicomputer-Sized Mainframe

(Continued from Page 1)

Designed for commercial, educational, government, engineering and service bureau applications, the 2020 is a general-purpose machine with a 36-bit word length. It is said to be able to handle programs of "more than a million bytes" in all languages.

Languages handled by the system include Ansi-standard Cobol, Fortran IV, basic and extended APL, Basic Plus-2, Algol and CPL — a PL/I subset,

In addition, the system features a Codasyl-standard data base management system, an interactive query language and report writer. It will accommodate multistream batch, transaction processing and interactive time-sharing operations with as many as 10 users, the spokesman noted.

The CPU features a centralized bus structure similar to that used on the firm's PDP-11 minis. Various components are directly attached to the bus while peripherals interface to the CPU through a standard PDP-11 Unibus adapter and Unibus cabling. This enables the system to use standard DEC peripherals, the spokesman said.

The CPU is contained on four boards compared with the 52 boards required to implement the Decsystem-2040 and 2050 processors. One board contains 10 4-bit microprocessors.

The 2020 also makes use of a 512-word virtual address cache memory. Using a 2K-word random-access memory writable microstore, the machine's basic microinstruction cycle time is 300 nsec, DEC said.

Memory for the system consists of a control unit that connects to the backplane and can handle up to eight storage modules. Each module handles 64K words of MOS memory with 1.05 microsec cycle time and a single- and double-bit error correction. A total of 512K words or 2M bytes of main memory can be accommodated

Micro-Based Console

The system's console incorporates a microprocessor that controls console and diagnostic functions. An asynchronous interface allows the system operator to transmit console commands to the system from a terminal.

The console is interfaced to the central bus for data and control commands. Each day, when the system is started up, the console performs diagnostics to ensure proper operations and also activates system elements, the spokesman said.

The system can be used in distributed processing networks operating under Decnet, the spokesman pointed out. Up to 32 asynchronous terminal interfaces and two synchronous interfaces are included in the system's chassis. Eight asynchronous interfaces are standard.

The Decsystem-2060 introduced to extend the high end of DEC's 20 line "has basically the same computer performance as the 2050" but incorporates an optimized version of the firm's processor.

Hardware, monitor and microcode changes were made to the system and racks and memory links were added, the spokesman noted. With the changes, the 2060 can handle twice the amount of memory and double the number of jobs as the 2050, DEC said.

A minimum Decsystem-2020 costs $150,000 for the CPU, 500K bytes of MOS memory, 512-word cache, a 67M-byte disk drive, a 120 byte/sec tape subsystem, eight asynchronous communications lines, a Decwriter II console teleprinter and operating software. It will be available in July.

The basic Decsystem-2060, available in the fourth quarter, costs $583,600 for a CPU, a 2K cache memory, LA36 console, 512K words of memory, 200M-byte disk subsystem, eight asynchronous lines and operating software.

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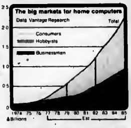

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DDP Net Reaches Overseas

(Continued from Page 1)

The second installation, at the consumer products group, is an integrated order entry, inventory control and invoicing application that had previously been run by a time-sharing service. The service cost became so high the company needed to find a way to replace the expense. The minicomputer system was brought in to take over the activities and interface with an existing system running on the firm's IBM 370/158 mainframe.

Local Data Sets

Much of the firm's processing, Cook noted, will still be done on the host system, but users in remote areas will have access to local data sets and the accompanying local report output.

Fairchild is also close to bringing up an order entry system for four branch sales offices in Europe and will displace a time-sharing service for order entry for the domestic U.S., he said. For the latter application, each branch sales office will use a Teletype-like device to access the Syfa through a packet-switching service the company is buying from Tymnet, he said.

The firm thought it might develop some sort of distributed network several years ago, and "in late 1975 we started the development of a shipping system on an IBM 3790," Cook said. The system was installed in February 1976 and "nine months later, with the work of six analysts, we brought up the 3790 to do shipping." He said Fairchild learned that the development time was too slow for its needs, that the transmission speeds used were too slow and that the company needed more disk capability than was available on that system.

At that point, the firm decided to look at other hardware and gave many vendors the opportunity to respond to its needs. Among those active in the selection process were Digital Equipment Corp., Data General Corp., Raytheon Co., Hewlett-Packard Co. and CA. "We found them all to have viable distributed processing systems," he said. "All of them have strengths ... and all of them were nearly equal" in capability, he added.

The CA system was one of the last ones to be evaluated, he noted. The vendor "volunteered" to come in and bring the system up "without obligation on our part," and CA said it would do that in 30 days. "We decided to let them try," he said.

Those remote systems that are operating at the moment are communicating as Bisynch devices in IBM 3780 mode. Fairchild is in the process of bringing up a Hasp workstation mode and "in the relatively near future, we will be operating using Synchronous Data Link Control (SDLC)," Cook said. SDLC is very important to the company because all international communications now takes place via satellite, and with Bisynch communications, the throughput speeds are degraded, he pointed out. SDLC will help Fairchild avoid the degradation.

The vendor is "committed to us" to "supporting an SNA environment," Cook added, which was another factor that made the choice of the CA systems more attractive.

Along with setting up a distributed network, Fairchild is committed to finding better ways to service that net, Cook noted. The ability to remotely diagnose problems at the DDP site is "vital," he continued. Fairchild has a terminal in the data center that can "become a terminal on the Singapore Syfa," allowing the in-house staff to examine the code and diagnose failures.

"We are also developing a capability for downloading the operating system," Cook said, because there are hardware failures that can disable code and the DP department would like to "just refresh the operating system" if this happens.

One of the prime benefits of using the Syfa systems is ease of programming, Cook said. Systems can be developed quickly on the system and "we could almost meet user expectations," he added. For example, the consumer product group system took only about 60 days to bring up, he said.

To Help Avoid Vision Problems

Engineers Set to Study Lighting and CRT Use

By Marguerite Zientara
CW Staff

DETROIT — A group of illuminating engineers here is hoping to do an in-depth study on optimum lighting conditions for CRT operators to help avoid visual problems like eyestrain and eye fatigue.

According to Steve Stannard of Smith, Hinchman & Grylls, an architectural and engineering firm here, there apparently have been no previous studies made of the problem. "The problem is so obvious and so widespread that you'd think some manufacturer would spend some money to find out how best to design its equipment," Stannard said.

The Illuminating Engineering Department at Smith, Hinchman & Grylls designs lighting systems for buildings built by the company as well as for outside clients. "The type of design we do for lighting is based on visibility, not illumination, the difference being how well you can see what you're looking at as opposed to how bright it is or how much light is falling on it," Stannard explained.

The system used to evaluate visibility is called Equivalent Sphere Illumination (ESI), which was developed partly at Ohio State University and principally by the Illuminating Engineering Society (IES), a national organization. The ESI system has been accepted by the IES and the concepts for it have been accepted by the International Commission on Illumination (CIE), according to Stannard.

'Veiling Reflections'

CRT screens in particular pose the problem of what are called "veiling reflections," which is simply the reflection of a bright light coming from a source behind the operator onto the screen. That brightness on the screen reduces the contrast of the letters one is looking at, Stannard said. The problem is to minimize that reduced contrast.

"We have some computer programs, written here, that are available through national time-sharing services and can predict essentially these effects," Stannard said. "All we need to know is what the luminous environment of the room is — where the lights are placed, what the reflectances of the walls are, the photometric characteristics of the lights themselves (how they distribute the light) and how the office task to be done on the CRT reflects light," Stannard explained.

When dealing with "horizontal" office tasks — for which pencil and paper, photocopy or offset printing or typing is used in conjunction with a CRT — the procedure is to measure with special equipment the photometric characteristics of those tasks, or how they reflect light, according to Stannard.

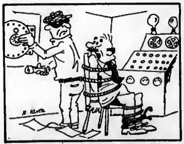
"That information is used with our computer program to predict what the eventual luminance and contrast will be," Stannard noted. "From that, we can calculate the visibility of these things to determine how much visibility is necessary," he added.

"We're hoping to calculate a whole series of luminous environments — rooms with different screens that are being used most commonly today — to determine how best to light a room when you have one of these terminals in it, or if you have a room with a given lighting system, how best to orient a screen to minimize the problems," Stannard said. "Being able to balance between seeing the paper you're reading from and seeing the screen you're typing into is the ultimate goal."

Stannard sees a number of advantages with the system. For existing rooms, it might help determine which lights should be turned out for better visibility as well as energy conservation. He thinks manufacturers could use the system in order to optimize the design of their own screen materials.

According to Stannard, use of the ESI has become law in some states, notably Florida, where the educational environment must now be designed in terms of visibility. He said that the Canadian government is accepting it and that it will eventually be used for all Canadian federal buildings. While the U.S. General Services Administration is looking at the system, it has made no decision yet, he noted.

Stannard and his colleagues are looking to the federal government for funding of the project, which he estimates will be completed within a year. The end product would be a manual on how to use certain terminals within a given environment and how to modify given environments to suit specific types of terminals.



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COMPUTER ASSOCIATES

Kennedy Backs CCIA in Bid for Interim Relief

By Edith Holmes
CW Washington Bureau

WASHINGTON, D.C. — Sen. Edward M. Kennedy (D-Mass.) last week endorsed recommendations by a trade association that the Justice Department seek interim relief in its antitrust case against IBM at the close of the government's presentation of evidence.

Kennedy, the chairman of the Senate Antitrust and Monopoly Subcommittee, did not specify the form this relief would take. According to its advocate, the Computer & Communications Industry Association (CCIA), interim relief could involve a court order requiring IBM to disclose the interface specifications of new products when they are announced or to report its installed base to permit the generation of an accurate census of the industry.

The senator also made his first public statement in opposition to the Consumer Communications Reform Act, or "Bell Bill," which would restrict competition in the communications industry by giving AT&T a broader based monopoly.

Addressing the CCIA's Fifth Annual Caucus here, Kennedy won applause when he stated that "if the opportunity exists for the government to be innovative, and even take a risk, in order to speed up the trial [U.S. vs. IBM] in the long run, then that opportunity should not be missed."

The senator credited the CCIA with suggesting that the government seek interim relief in the case, which has been at the trial in New York City for nearly three years. The Justice Department has yet to finish presenting evidence to support its charge that IBM monopolized the general-purpose computer systems and peripheral equipment and leasing markets.

'Sideshow Attraction'

"The IBM case has become a sideshow attraction for those concerned with effective and efficient antitrust enforcement," Kennedy said. "The government, the defendant and the judge all bear some responsibility for the absurdity.

"Discovery and the government's presentation of its case have broken all records for length volume. Final resolution of the case will not come for five or 10 years or longer. And there are areas where there exist no genuine issues of fact as to IBM's practices," the senator added.

CW At CCIA

During this process, Kennedy stated, more and more independent computer companies are going out of business; viable smaller companies cannot expand their market shares because capital will not flow to companies that exist only by IBM's sufferance.

In the meantime, IBM profits have grown 200%, its sales have increased from $7 billion to $18 billion and its market power has increased "significantly."

For all these reasons, Kennedy said, he supports the imposition of interim relief on IBM at the conclusion of the Justice Department presentation.

Supports Antitrust Unit

In addition, the senator indicated his endorsement of the special Presidential Commission on Antitrust, established at the end of last year to address the problems associated with large, complex antitrust suits [CW, Dec. 12].

"Implementation of the commission's proposals should make future IBM-style cases impossible," Kennedy said.

Even with procedural revisions of discovery practices, the granting of judicial authority to restrict and punish delaying tactics, more efficient means of entering testimony and documents into evidence and a more "imaginative performance by the [Justice Department's] Antitrust Division," there are legislative improvements that can be made in the enforcement of antitrust laws, the senator stated.

In the months to come, the Senate Antitrust and Monopoly Subcommittee plans to develop legislation that deals with concentration of economic power in the economy as a whole, not merely in a particular industry or market, Kennedy said.

The antitrust laws clearly outlaw mergers that increase a firm's dominance of a particular market, but generally fail to deal effectively with mergers that result in the increasing dominance of the entire economy by a few giant conglomerates, he added.

"Legislation which prevents the gobbling up of independent businesses by increasingly large and aggressive conglomerates should be a matter of high antitrust priority," Kennedy said.

The senator also expressed the need for legislation "that makes clear that the Sherman Act does not require the elaborate search for corporate 'intent' that mires so many antitrust suits in a decade-long search for why something was done instead of the far easier and more important fact of what was done.

"Emphasis on objective conduct rather than subjective intent would return antitrust enforcement to the principles and purposes that Congress originally intended," Kennedy said.

In the communications industry, the specialized common carrier and the terminal equipment marketplaces have benefited greatly from competition, the senator said. "Although AT&T and the other telephone companies have complained loudly about this competition, specialized common carriers only represent .1% of the telecommunications market and competitors to Bell have only .4% of the terminal equipment market," he noted.

"In addition to bringing forth new and better products and services at lower costs, competition has made AT&T more responsive to user needs," Kennedy said. "There is also ample evidence that this competition has not hurt AT&T in any way," he continued, citing hearings he chaired last May and those held by the subcommittee's former chairman, the late Sen. Philip Hart.

Kennedy told the CCIA he agrees with the association's observation that the Federal Communication Commission's (FCC) use of competition in selected portions of the communications industry "has brought about excellent results and I see no reason to discourage these initiatives.

"If anything, the FCC should be prodded to increase competition at a more rapid rate," the senator stated.

To these ends, Kennedy last week reintroduced his Competition Improvements Act, which would reaffirm and more tightly apply antitrust standards to federal regulatory agencies such as the FCC.

U.S. Deciding Whether to Ask for Relief

(Continued from Page 1)

put us in a position to litigate this case within two years," Shenefield said of U.S. vs. AT&T.

Whether it will be tried expeditiously is another matter because the defendant's incentive in an antitrust case is to delay, the Assistant Attorney General pointed out.

"You see AT&T today acting as a rational defendant in a [Sherman Act] Section 2 case — resisting expedition, multiplying issues and obstacles and engaging in a widespread public relations campaign to portray 'the system' as the victim of quixotic government prosecutors and as the savior of everything from the national defense to pro football telecasts."

Defendants employ a "Catch-22 logic" when it comes to the quick resolution of an antitrust case, Shenefield suggested. For AT&T, which is in the midst of discovery — the amassing of witnesses and of documents from which evidence is selected — "fairness means mutuality means discovery at the chosen pace of the slowest party," he said.

"There should be no concern about our intentions to stay the course in both the IBM and AT&T cases," Shenefield stated.

Other issues in the computer and communications industry in which the Antitrust Division is involved include opposition to the Federal Communication Commission's (FCC) approval of the joint venture known as Satellite Business Systems (SBS) and its own independent investigation of SBS; the FCC's second Computer Inquiry, which seeks to distinguish between DP and communications; the Postal Service's flirtation with electronic mail; and the Federal Reserve's affair with electronic fund transfer systems.

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IBM Cuts 138, 148 Prices

(Continued from Page 1)

with CPU, integral storage controller, two 3203 printer attachments, 3047 power unit and a 3287 Model 2 console printer now carries a $754,045 price tag compared with $898,295 previously.

A similarly configured 3031 costs $1 million, the spokesman noted.

Representative products and features affected by the price cuts include the 3330/3340 integrated file adapter for the models 138, 135 and 135-3; it has been reduced from $38,910 to $30,970. An integrated communications adapter that is now $9,470 formerly cost $11,900.

On the 145, 145-3 and 148 systems, examples of units affected by the price cuts include the channel-to-channel adapter, which has been reduced from $15,710 to $12,510, and the control store expansion unit, which was cut from $13,390 to $13,050.

Power supply units were also affected by the reductions. A 3046 Model 1 for the Models 135 and 138 now costs $13,580 compared with $17,060 previously and a 3047 Model 1, used with the 145 and 148 CPUs, now costs $18,140 compared with $14,440.

Antitrust Overemphasized

Information Policies Seen Lacking

By Edith Holmes
CW Washington Bureau

WASHINGTON, D.C. — The fundamental issue facing the computer and communications industries and the government is not monopoly vs. competition, but how to define and administer the information age, Sen. Ernest F. Hollings (D-S.C.) said at the Computer & Communications Industry Association's (CCIA) fifth annual caucus here last week.

The government's antitrust cases against IBM and AT&T are important, the chairman of the senate communications subcommittee stated, but they are only one effort to restructure the nation's computer and communications institutions.

"In the final analysis, whether IBM is broken up [and] whether AT&T is forced to divest itself of Western Electric may be important issues to the chroniclers of antitrust cases, but it is my opinion that other issues will have a more significant impact upon the quality of our daily lives," Hollings said.

Similarly, Congress' rewrite of the Communications Act of 1934 is "an important effort" in Hollings' view, that needs to be put in perspective with such issues outside its purview as export-import policy, capital formation and federal procurement of computers and communications.

"One overriding concern is clear: The government must come to grips with communication and information policy," the senator said.

Not only do communications and information "touch every aspect of our lives," they have become big business as well, Hollings stated. In this "information age," nearly half of the nation's gross national product owes its being to these industries, he added.

'No One in Control'

But at the present time, the government has no policy regarding information and communications. "There is no one in control. There is no coordinated planning. As a result, the technology, which should be providing only the force for change, is also providing the direction," Hollings said.

Information policy is inextricably tied to computers and communications networks, the senator stated. New developments in information technology will have significant social and economic consequences that must be recognized and addressed.

He said the U.S. needs a mechanism for dealing with "internal problems" — "Where does monopoly end and competition begin?" — and "external problems" — "What is the effect of electronic funds transfer systems on the Postal Service and electronic mail?...

"The logical entity to fill this role would have been the Office of Telecommunications Policy (OTP), and I have argued long but unsuccessfully for its retention in the White House for just this reason," Hollings reminded his audience.

Whether the President's decision to abolish OTP and create a new National Telecommunications and Information Administration (NTIA) will be able to perform the role remains to be seen.

"Its revised executive order bears the scars of successful jurisdictional grabs by the departments of Defense and State, the Office of Management and Budget and the General Services Administration," Hollings said.

CW At CCIA

"Nevertheless, the draft executive order I have seen gives NTIA a respectable mandate, and with aggressive leadership and support from the Secretary of Commerce and the White House, it has a reasonable chance to succeed," the Senate subcommittee chairman continued.

The Senator also predicted that a national information policy is years away. For example, when the Federal Communications Commission (FCC) releases its Second Computer Inquiry findings on the distinctions between DP and communications in June, these conclusions will necessarily be challenged in the courts, he predicted. "Further, it is inevitable that these findings will not be definitive," Hollings added. At the same time, the computer and communications industries "have proven their ability to meet special needs and to survive in the world of giants."

CW Photo by E. Holmes

Sen. Ernest F. Hollings

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U.S. Buttresses Its Case for Flat Rates Abroad

By Edith Holmes
CW Washington Bureau

WASHINGTON, D.C. — Two U.S. data services firms have submitted explanations of the safeguards they employ to prevent abuse to the Consultative Committee on International Telephone and Telegraph (CCITT), which will meet in Geneva next month.

The move was seen as an effort to persuade foreign governments that their DP networks are not being "misused" as mere communications conduits and to buttress arguments in favor of keeping private communication lines available at flat monthly charges to all users who need them.

The firms submitting statements were Control Data Corp. and General Electric Co.

The Computer Business Equipment Manufacturers Association (Cbema) also drafted a statement to the U.S. delegates to the CCITT suggesting that, in many cases, the public data networks run by foreign governments "do not really meet the specialized needs of the user with a large data transmission requirement."

Neither CCITT nor the Federal Communications Commission (FCC) permit the transmission of unprocessed information between users of the same DP service, Cbema pointed out in a cover statement to the CDC and GE contributions.

A communications customer operating a DP center may face serious problems, "including the discontinuance of telecommunications services, if it allows its users to violate these restrictions," the Cbema paper said.

Adherence to Rules

In answer to concern over possible misuse of DP networks, CDC and GE acknowledged their dependency on private leased circuits and, as a result, their need to ensure that the communications services connected to their DP sevices are used in accordance with CCITT rules.

Among the approaches taken by these two are special training for sales and service personnel detailing the restrictions on the communications aspects of their DP operations. DP customers also are informed of these restrictions.

CDC and GE customers are required to sign contracts containing clauses about communications restrictions. They are supplied with training manuals, operations manuals and sign-on procedures reminding them of the need to respect the rights of the communications carriers.

Periodic checks of system logs attempt to spot any customers who are misusing the DP service are also employed, CDC and GE said.

If a carrier has reason to believe a GE or CDC customer is misusing the DP facility and presents the DP supplier with evidence of such a violation, the firm will meet with the customer, issue a warning and discontinue service if that warning is ignored.

Phillip C. Onstad, manager of CDC's telecommunications policies, said in the statement for his firm that "Control Data feels these procedures have been very effective as we have not received a single complaint from any communications carrier or administration concerning the misuse of the communications aspects of our data processing services."

Cbema Stresses Performance

In its paper, Cbema expressed the view that DP systems used as internal corporate tools are made available to many subscribers on a time-shared basis "rely very importantly on the traditional leased circuits and networks which are used to transmit data according to the formats, codes and speeds that mean optimum performance for each user."

The association cited as examples reservation systems and production control systems where information is needed at dispensed locations on an immediate basis.

To maintain the balance between hardware and software control in these systems, there must be control over all input and output functions, including remote terminal devices that carry information to and from the system, Cbema stated. Many interactive applications require a highly complex I/O protocol with a tailored telecommunications metwork in order to maintain optimum system performance, and often this need can only be net through leased circuits and networks, the association added.

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Doctors Get Expert 'Help' At Salt Lake City Hospital

By Owen K. Darrath
Special to CW

SALT LAKE CITY, Utah — A system at LDS Hospital here is helping doctors care for their patients by providing access to the latest findings from research and clinical journals.

The program, developed over a 12-year period, is also involved in other phases of patient care ranging from monitoring heart and intensive care patients to watching for interaction between drugs.

The Health Evaluation through Logical Processing (Help) program runs on dual Control Data Corp. 3300s and has been up for "better than 98% of the time," according to Dr. Homer R. Warner, chairman of medical biophysics and computing at the University of Utah College of Medicine.

Decision Making Aid

According to Warner, the program aids physicians in decision making, instead of supplanting them, and is "really affecting the way they practice medicine." Initially, he said, there was some resentment of the system, and his toughest problem was winning the confidence of the medical personnel using the system.

Now, he said, physicians feel that using the system "is like having an expert looking over their shoulders." The system requires no special training for the physician, he noted.

First Patient Contact

The first patient contact with the computer occurs during the admitting process. Patients have responded "very favorably" to the self-administered medical history, which takes an average of 14 minutes, according to Warner.

All routine testing equipment, such as blood chemistry analysis units, is interfaced to the computer, which combines the patient data and lab test results, and presents that information organized by primary and secondary diagnosis, to the physician.

CRT terminals at nursing stations, intensive care units and pharmacy are then used to enter and retrieve patient data. Presentation of data to the physician is accomplished with menus ("Choose one") to make the system easy to use.

In addition to providing diagnostic information, the system can also analyze electrocardiograph data transmitted from the patient's bedside and is used on-line by anesthesiologists during surgery.

Using 'Matched' Payroll Data

HEW to Start Student Loan Collection Efforts

By Edith Holmes
CW Washington Bureau

WASHINGTON, D.C. — The Department of Health, Education and Welfare (HEW) will use private collection firms to run down bad student loan debts identified as part of the department's computerized Project Match — but only on a pilot basis, HEW Secretary Joseph Califano announced here last week.

The federally employed loan defaulters were identified recently by matching computerized federal payroll records against lists of loan defaulters [CW, Jan. 23].

Private collection firms will be used only in HEW's Atlanta and San Francisco regions, according to Califano, who indicated that requests for proposals for this work will be put out soon.

"We are very concerned about the privacy of individuals," Margaret Rhoades of HEW's Office of Education said, adding that the pilot collection efforts will seek to measure the impact this form of recovery would have on individual privacy.

HEW hopes to collect $416 7 million in unpaid student loans nationwide under this program [CW, Jan. 23].

The concern inside and outside the federal agency is that personal information on student loan defaulters collected under Project Cross-Check may be used against these individuals by the private organizations assigned to collect that particular debt, an HEW spokesman said. Private collection firms do not have to adhere to the Privacy Act of 1974 as do federal agencies.

Other Programs Progressing

Meanwhile, other computerized matching programs run by the HEW Inspector General's office to detect fraud by federal employees in the Aid to Families With Dependent Children (AFDC) welfare program and by physicians and pharmacists in the Medicaid program are moving ahead.

Project Match, which compares federal payroll records with welfare rolls, has been conducted for the 25 largest districts in the 50 states and in the District of Columbia in an effort to find people on the rolls of more than one state in addition to those who are federal employees, the spokesman said.

So far, HEW has uncovered 13,584 cases in which a person on one welfare roll turned up on another — occasionally in the same state, but in different jurisdictions, he noted.

These cases have been turned over to the states for follow-up action, the spokesman stated.

A pharmacist in Kansas is the first to be indicted under Project Integrity, the program designed to unmask Medicaid fraud by health care professionals. "We expect quite a number of indictments to come out of that program now," the HEW spokesman said.

The Kansas pharmacist had two pharmacies that each handled prescriptions for Medicaid patients. The two stores were permitted by law to have different pricing arrangements because of different overhead costs.

The pharmacist committed fraud when he used the more expensive pharmacy's charges for all his Medicaid prescriptions, he said.

HEW is examining some 2,400 cases of physicians and pharmacists across the 50 states under Project Integrity. They were selected for investigation because theirs were among the most aberrant Medicaid records in the U.S.

Arizona Court Supports HIS In Tax Ruling

By Owen K. Darreth
Special to CW

PHOENIX, The Court of Appeals here has ruled that the Maricopa County tax assessor unfairly discriminated against Honeywell Information Systems, Inc. in assessing personal property taxes in 1973 against 39 pieces of computer equipment HIS had leased to various users here.

In a ruling handed down in November, the court found that the evidence offered by HIS made it apparent that the assessor levied personal property taxes against the firm on a different and more inclusive basis than other similarly situated taxpayers during the same period.

HIS had claimed that the county assessor was basing his tax claim on its published list prices, which included systems support enginering services and student instruction and which were not necessarily actual prices charged customers.

Chief Judge Donald Froeb ruled that while Arizona statutes have long authorized taxation of intangibles, "our cases have held that intangibles may not be taxed because the legislature has failed to provide a means of equalization for or collection of a tax against intangibles."

He also noted that Maricopa County is a member of the International Association of Assessing Officers, which has published guidelines for assessing DP equipment which state that intangible services should not be included in the assessed value of DP equipment.

Thomas Maher, an attorney for HIS, told CW that the case must go back to the Maricopa County Superior Court as a matter of legal form, where he expects the Court will rule in HIS's favor and order a refund of the taxes it paid on the intangible services.

COBOL programmers...
Increase your productivity now

Like it or not, management's emphasis in the next decade is going to be on productivity. With hardware performance increasing by a factor of 100 every decade and programmer productivity increasing by only three per cent per year, there's no other way around it. And that means continued interest in the improved programming technologies, including top-down design, HIPO documentation, structured coding, and top-down testing. In short, the emphasis is going to be on a collection of techniques that are related to the structured programming movement.

At present, however, few companies are benefiting from the improved programming technologies. Only about one-fourth of the computer installations claim to be using the new technologies. And I know that many of these companies use the techniques far less than they would care to admit.

From a programmer's point of view, this presents a unique opportunity. If someone is going to pioneer the productivity techniques in your shop, why shouldn't that someone be you? At the least, you'll work with a new confidence and efficiency. And you're likely to be rewarded in other ways as well.

With this in mind, I'm happy to announce a book that I think will have a major effect on programmer productivity in the next decade. It is called *Structured Programming for the COBOL Programmer*. As I see it, it is the *first* book or course that presents a *complete*, consistent, and *practical* method for implementing the improved programming technologies. And it is chock-full of ideas that aren't available anywhere else.

What this Book Does

Like other books on structured programming, this book presents the theory behind the structured programming movement. Unlike other books, however, *Structured Programming for the COBOL Programmer* presents a complete system for applying the theory. In just six chapters, you will learn how to design, document, code, and test structured programs in COBOL.

In chapter 2, for example, you'll learn how to design a structured program. You'll learn the four steps for creating structure charts ... what modules should go at what level .. why there should only be one read or write module per file ... the six things to watch for when reviewing a structure chart ... how to number the modules in a structure chart ... and much more.

In chapter 3, you'll learn how to document the modules using HIPO documentation. You'll learn the six steps for creating HIPO diagrams what language to use in the process box ... when and how to use extended descriptions .. how to keep the modules independent . and so on.

In the same way, chapters 4, 5, and 6 cover everything you need to know to use the remaining techniques for improving productivity. You'll learn such things as what sequence to code the modules in . how to eliminate 77 levels from your Data Divisions .. the one case in which a GOTO is required .. how the paragraph names in the COBOL program relate to the HIPO diagrams and to the structure chart .. when to use top-down testing .. and how to code three different types of program stubs.

4 Reasons Why this Book is Effective

1. The author, Paul Noll, is a software specialist and COBOL expert He is also responsible for the training of 250 programmers. As a result, his programming methods are superb, and his teaching methods are effective.

2. Paul never presents theory without showing its application. In contrast to other books and courses, this book is based around the development of four different kinds of business programs. Once you see how Paul's method is applied to these problems, you will forever see the value of structured programming.

3. This book presents structured programming in the context of COBOL. As a result, you will see all of the structured coding techniques in COBOL (and only COBOL). You will also see how design and documentation are related to the programming language used

4. This book contains dozens of illustrations taken from all phases of structured programming You'll see structure charts and HIPO diagrams for each of the four programs developed in this book; you'll see structured COBOL, program stubs, test plans, and much more In my experience, these illustrations, more than any other factor, determine whether an EDP course is effective .. and they are the missing ingredient in other structured programming books

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Calendar

March 22, Hartford, Conn. — **Greater Hartford Chapter of the EDP Auditors Association Formation Meeting.** Contact: Al Nirerenberg, Price Waterhouse & Co., 1 Financial Plaza, Hartford, Conn. 06103.

March 29-31, Chicago — **The New Financial Systems,** sponsored by the American Institute of Industrial Engineers (AIIE). Contact: Dept. PR, AIIE Seminars, P.O. Box 3727, Santa Monica, Calif. 90403.

March 30-31, Washington, D.C. — **Data Entry Management Association (Dema) Regional Seminar.** Contact: Dema, 16E Weavers' Hill, Greenwich, Conn. 06830. Also being held May 11-12 in Columbus, Ohio.

March 31, Harrisburg, Pa. — **Data Processing Management Association (DPMA) Region 11 Conference.** Contact: James F. Towsen, The Statesman Group, 2150 Herr St., Harrisburg, Pa. 17105.

April 3-4, New York — **Planning and Initiating the Data Base Project,** sponsored by Performance Development Corp. (PDC). Contact: PDC, Bldg. M, 1101 State Road, Princeton, N.J. 08540. Also April 10-11 and June 26-27 in San Francisco.

April 3-4, San Francisco — **Data Communications: Advanced Concepts and Systems,** sponsored by Datapro Research Corp. Contact: Don Welsher, Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

April 3-5, Chestnut Hill, Mass. — **Designing, Developing and Operating Teleprocessing Systems,** sponsored by Boston College School of Management. Contact: Management Institute, Fulton Hall, Boston College, Chestnut Hill, Mass. 02167.

April 3-5, New York — **Data Base Management Systems: General Concepts and Planning Guidelines,** sponsored by Datapro Research Corp. Contact: Don Welsher, Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075. Also April 12-14 in Chicago, and April 17-19 in Washington, D.C.

April 3-5, Washington, D.C. — **Life Cycle Management for ADP Systems,** sponsored by the American Institute of Industrial Engineers (AIIE). Contact: Dept. PR, AIIE Seminars, P.O. Box 3727, Santa Monica, Calif. 90403.

April 4, St. Louis — **Pricing Computing Services in Colleges, Universities and Non-Profit Organizations,** sponsored by Interuniversity Communications Council, Inc. (Educom). Contact: Carol Parysz, Educom, P.O. Box 364, Princeton, N.J. 08540.

April 4-5, Seattle — **Computer Trade Show,** sponsored by the Puget Sound Chapter of the Data Processing Management Association. Contact: Betty Matthews, Show Chairman, 1830 234th Place S.W., Bothell, Wash. 98011.

April 4-5, New York — **How to Evaluate and Contract for Facilities Management/Computer Services,** sponsored by Mathews & Co. Contact: R.S. Mathews, Mathews & Co., P.O. Box 2064, Darien, Conn. 06820.

April 4-6, Boston — **Management Skills for Newly Appointed Managers,** sponsored by Advanced Management Research (AMR). Contact: AMR International, Inc. 1370 Ave. of the Americas, New York, N.Y. 10019.

April 4-6, Washington, D.C. — **National Business Equipment Show.** Contact: Joseph Doblmeir, Convention Management Association, P.O. Box 32, Carle Place, N.Y. 11514.

April 4-6, Toronto — **Data 78,** sponsored by ComputerData Magazine. Contact: Paul J. Day, Data 78, Suite 2504, 2 Bloor St. West, Toronto, Ont. M4W 3G1, Canada.

April 5-7, New York — **Word Processing Toward the Automated Office,** sponsored by the American Institute of Industrial Engineers (AIIE). Contact: Dept. B-WPAPRI, AIIE Seminars, P.O. Box 3727, Santa Monica, Calif. 90403. Also being held in Washington, D.C., Sept. 25-27.

April 5-7, Detroit — **Fourth Annual Computer Graphics Conference and Equipment Display,** sponsored by the Engineering Society of Detroit (ESD). Contact: ESD, 100 Farnsworth, Detroit, Mich. 48202.

April 5-7, Cherry Hill, N.J. — **Data Processing: An Introduction to Concepts and Systems,** sponsored by Datapro Research Corp. Contact: Don Welsher, Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

April 5-7, Chicago — **Effective Computer Operations Management,** sponsored by Datapro Research Corp. Contact: Don Welsher, Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075. Also being held April 12-14 in San Francisco.

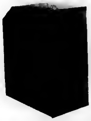
April 9-12, Miami — **Common's 1978 Spring Conference.** Contact: David G. Lister, Administrative Director, Common, Dept. M2, Suite 1717, 435 N. Michigan Ave., Chicago, Ill. 60611.

April 9-13, San Diego — **Americas Univac Users Association Spring Conference.** Contact: Barbara Gattus, Federal Yeast Corp., Highlandtown Post Office, Baltimore, Md. 21224.

April 10-11, Washington, D.C. — **New Directions in Competitive Procurement — Computer Systems, Defense and Other Government ADP Programs,** jointly sponsored by American Institute of Aeronautics & Astronautics, Data Processing Management Association and Technical Marketing Society of America (TMSA). Contact: TMSA Seminars, P.O. Box 91295, Dept. CS, Los Angeles, Calif. 90009. Also being held in Los Angeles May 11-12.

April 10-12, Washington, D.C. — **Data Communications: An Introduction to Concepts and Systems,** sponsored by Datapro Research Corp. Contact: Don Welsher, Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075. Also held in New York April 17-19.

April 10-12, Washington D.C. — **Managing Data as a Resource — How to Implement a Data Resource Management System,** sponsored by Data Resource Management Associates. Contact: Arnold Barnett, 19 Orchard Way North, Rockville, Md. 20854.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Startup Expected by April

Trading System to Link Five Stock Exchanges

By Tim Scannell
CW Staff

WASHINGTON, D.C. — A computer-based market-connecting system that will link five major stock exchanges across the country is scheduled to become operational by April.

Developed by the New York Stock Exchange (NYSE) in accordance with guidelines mandated by Congress in The Securities Acts Amendments of 1975, the Intermarket Trading System (ITS) will connect the New York bureau with those of the American, Boston, Philadelphia and Pacific stock exchanges, an NYSE spokesman said.

Although ITS hasn't been hailed as "the" national market system or even a major improvement, the exchanges are cooperating with one another in an effort to ease Congressional pressure and deflect Washington charges of footdragging on the issue.

Basically, the intermarket system would work this way: If a broker on the NYSE receives an order to sell 50 shares of a particular stock, he will first check the current price offered on the New York exchange to see if it meets or exceeds the price at which he is willing to sell. If the broker is not satisfied with the New York price, he can then check the quote display of the ITS terminal and see if some other market is able to match his price, the spokesman explained.

If New York is unwilling to equal the better price, the broker can then send a message to the other exchange, via ITS, stating his interest in selling at its price. If no intervening trade has occurred, changing the selling figures, the trade is executed and confirmed in as little as 30 seconds, the spokesman said.

Communications Control

Communications between the exchanges will be handled by a centrally located T/16 dual processor manufactured by Tandem Computers, Inc., a spokesman explained. Participants will initially access other stock exchanges via AT&T Dataspeed 40 terminals linked to the computer, probably located in New York. Bureaus will have as many terminals as they think are needed in order to receive and transmit the various price quotes.

Implementation of ITS is being coordinated by the Securities Industry Automation Corp. (Siac), a firm owned by both the New York and American stock exchanges. With such a system, "orders have a greater chance of achieving the best price for customers, no matter where they are," Lee Amaya, president of Siac, said. "I think it's absolutely the best way the market centers can 'break the ice' with regard to a national market system," he observed.

Not only will ITS "provide a basis for free competition among all the exchanges" but it will also allow brokers on participating exchanges free access to all trading floors without having to buy a membership, Amaya stated. A typical membership on the NYSE, for example, currently costs approximately $50,000.

One potential problem that might occur would involve establishing brokers' commissions.

For instance, if a number of stocks are bought or sold on the Pacific exchange by a broker on the Boston exchange, to whom should the commission be given and on what market rate should that commission be based?

"That's a policy sort of thing," Amaya noted. "It is my opinion that every market place will have its own policies and negotiate its commission structure with whomever the customer is."

"They [presently] have a so-called operations committee and will eventually, no doubt, have a policy committee" governing the conduct of the participants, he observed.

Although Amaya would not elaborate on the total cost of the intermarket system, he did say that individual expenses would be based on the number of trades within each exchange. Since the NYSE handles about 86% of the trades, "you can see who's going to pay the lion's share of the cost," Amaya said.

NCC Housing Set Up

MONTVALE, N.J. — A housing bureau has been set up for the 1978 National Computer Conference (NCC) to be held in Anaheim, Calif., June 5-8. Rooms are reserved at over 60 hotels and motels in the area. Accommodations are available to all NCC registrants at reduced convention rates, "providing that hotel reservations including the required deposit of $30 per room are postmarked no later than May 19," an NCC spokesman noted.

All requests must be processed on the official registration forms, and block reservations will not be accepted. Official housing bureau registration forms are available from the American Federation of Information Processing Societies, Inc. (Afips), 210 Summit Ave., Montvale, N.J. 07645, (201) 391-9810.

Citing the expected record-setting attendance, an NCC spokesman urged hopeful attendees to act as soon as possible to help ensure obtaining accommodations of their choice.

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On-Line System Tracks Music Use for Royalties

By Brad Schultz
CW Staff

NEW YORK — Music can seem as pervasive as the air through which it flows. At any moment there is a multitude of songs being played over radio and TV; in night clubs and discotheques; through jukeboxes and the Muzak speakers in lobbies and offices.

Behind each recorded song are the artists and producers that made it happen, and they are due certain royalty payments whenever their song is played. The formidable task of distributing these royalties fairly on a continuing basis is being handled here by a unique on-line music information system operated on IBM hardware.

Broadcast Music, Inc. (BMI), a nonprofit music licensing organization, uses this system to track use of more than a million song titles whose rights are owned by 47,000 songwriters and publishers. These songs are played by more than 8,000 radio stations, more than 750 television broadcasters and legions of night clubs, discotheques, symphony orchestras, background music services and jukeboxes, according to an BMI spokesman.

"We could not handle the magnitude of processing without a computer. This technology enables us to offer new services to our affiliated writers and publishers," BMI president Edward Cramer noted.

But even with a computer, performance counts upon which royalties are based cannot be made with exact precision. Instead, estimates of playing times are derived from marketing-type surveys, according to BMI spokesman Russell Sanjek.

Usage on radio and TV is determined by a regular representative sampling of 500,000 hours of music. Jukebox, nightclub and discotheque playings are gauged more indirectly — for example, by surveying record store purchases, he added.

Jukebox owners refuse to allow the attachment of counting devices to their equipment and have only this year agreed to pay royalties at all, Sanjek explained.

One could compute performance numbers or find all the songs recorded by a given artist interactively at BMI or from three remote sites, according to the firm's DP vice-president, Warren McFall.

"We operate our on-line . . . network from 8:30 in the morning to 6:00 in the evening . . . and then, when we bring it down in the evening, we have five [memory] partitions available to do batch work," he said.

Conversion From Univac CPU

McFall reminisced about BMI's conversion from a Univac 9400 CPU configuration to the present setup, noting that the conversion became necessary when the 9400's capacity was exceeded by BMI's mounting demands.

BMI requested conversion proposals from several vendors. Among them, Univac estimated that conversion to another Univac system would take about five years, McFall continued, adding that "you don't go into a conversion for more than a year — too many things change."

But IBM's estimate was about 14 months, far better than Univac's although still longer than McFall's one-year "rule." BMI decided to go with IBM.

As a result of the conversion to a new vendor line, BMI had to rewrite all its on-line software with only minimal systems support from IBM, McFall noted.

"We didn't really want [IBM] to get into any programs . . . We had to live with the programs later on [and] it's always been my philosophy that if you get good systems work and bad programs, you can recover; but if it's the other way around, forget it!

"It took us about 180 [machine] hours to extract the information from Univac disk files [and store it] on tape, and then we needed about another 50 hours to do the sorting of these records," he said. The records — corresponding to more than 900,000 BMI-licensed song titles plus more than 200,000 titles from foreign affiliates — had to then be formatted and linkages, such as title/publisher/writer, resolved.

The system's basic hardware configuration is solidly IBM and tops 1.5 billion bytes in memory capacity, McFall noted.

The configuration includes the 370/148 CPU with 1M bytes of memory; four 70 million-byte 3340 and four 280 million-byte 3344 direct-access storage modules; five 3420/5 magnetic tape units; and two 3203 1,200 line/min printers.

System software includes three IBM packages — the Customer Information Control System (CICS), DOS/VS and the DL/1 Query Support Feature —buttressed by about 800 internally developed batch programs, most of them written in 370 assembly language.

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IN DEPTH

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IN DEPTH

The Ten Great Software Myths

By Werner L. Frank

It's time to jettison some common misconceptions about software, the executive vice-president of Informatics, Inc. believes. This week, Frank attempts to debunk three of those myths; next week, he'll explore the rest.

Myth (mith), n. 1. A traditional or legendary story. 2. A story or belief that attempts to express or explain a basic truth. 3. A belief or a subject of belief whose truth or reality is accepted uncritically.

All disciplines are surrounded by myths, and the data processing field is no exception. Abstract as it is, software especially makes for an environment in which bountiful myths can thrive and become entrenched, for who really knows the truth? And who can prove anything?

The consequence of accepting what may be a myth can often be an investment decision based on unreality. Hence the discrimination of truth from half truths, of fact from belief, may serve the decision maker well.

At the risk of challenge from others who may produce a better decalogue, we present to the right the current 10 great myths of software.

Software represents a growing proportion of total data processing expenditures.

* * *

Software is (necessarily) expensive.

* * *

Software must follow hardware.

* * *

Software outlasts hardware.

* * *

Software needs continuing change.

* * *

Software productivity can be enhanced.

* * *

Software product manufacturers are more efficient producers.

* * *

Software must satisfy the user.

* * *

Software systems require a data base management system capability.

* * *

Software is the result of programming.

* * *

MYTH NO. 1

Software represents a growing proportion of total data processing expenditures.

Many experts continue to promote the notion that software accounts for the larger proportion of total DP expenditures. A report in 1977 quoted one authority as saying, "virtually every study in existence indicates that by 1985, 90% or more of the cost of data processing will be people costs, not hardware, making data processing the most labor-intensive industry, except possibly agriculture."

B.W. Boehm, writing in the May 1973 issue of *Datamation*, cited U.S. Air Force software costs as "going to over 90% of total [DP] system costs by 1985."

Even I made similar predictions in June 1968, also in a *Datamation* article, forecasting an 80% cost factor for software by the end of the '70s — thus reversing the hardware/software costs ratio from the 80/20 split that existed in the late '50s.

And a no less prestigious group than the authors of *Data Processing in 1980-85* asserted that "the total direct data processing dollar spent on hardware will decrease to between 15% and 25% from today's level of 25% to 45%," implying an increasing role for software.

That document, often referred to as the "Silt Report," was written by T.A. Dolotta, M.I. Bernstein, R.S. Dickson Jr., N.A. France, B.A. Rosenblatt, D.M. Smith and T.B. Steel Jr. and published in 1976.

A different set of experts, the IEEE Computer Society's Technical Committee on Computer Elements, said in a report on a July 1977 workshop that "the trend in cost of large systems has been rapidly increasing toward the software effort, with current estimates of 60% of the cost of systems comprising the software effort and 40% the hardware effort. Some prognostications predict the ratio could be as high as 98% software vs. 2% hardware by 1990."

The statistics reported in our technical journals are not lost on the general press. For example, the July 1977 issue of *Dun's Review* stated that "software is accounting for a bigger and bigger share of the data processing dollar."

Are these experts really right? To answer, one must agree first on what to count or measure and, secondly, how to ascribe costs to these complex elements.

In analyzing the cost elements of DP

(Continued on Page 14)

(Continued from Page 13)

operations, it is necessary to distinguish between the DP cost elements of the typical but individual data processing site and the expenditures for the entire economy. For example, *Datamation's* reviews of DP budgets in recent years have focused on the installation, whereas the data most often presented by International Data Corporation (IDC) represents total user expenditures. Data from these sources are shown in Figure 1.

Tracking the Measures

In general, such data excludes indirect cost items like personnel overhead as well as costs related to the physical plant supporting the hardware.

It is interesting to track these sets of measures, both in the past and with respect to forecasts of the future. The following is observed:

(1) Expenditure components as measured by IDC have followed a consistent pattern of increasing hardware (even excluding communications) costs as a part of total expenditures (38% in 1974 to 40% in 1977), with personnel costs decreasing (34% in 1974 to 30% in 1977).

(2) More significantly, IDC forecast the 1975-1983 individual user site spending profile in the U.S. will move as follows:

	1975	1983
Hardware and Support	57%	62%
Staff	43%	38%

As a consequence of an 11% per year increase for nonpersonnel expenditures and only a 9% per year increase in staff costs.

(3) Quite independently, the organization Input found in every one of the 10 industry sectors it surveyed that the expenditure patterns for DP budgets for 1976 and 1977 showed equipment at a year-to-year percent increase that exceeded the in-house personnel expenditure growth. In fact, for the entire sample studied, the hardware percent increase was almost twice the expected growth in personnel costs.

Upward-Moving Index

A Diebold Group, Inc. Research Report observed in 1971 that "the whole concept of 'automation' was deeply grounded in a movement away from labor intensiveness." It therefore seems incongruous that within the DP field itself we continually predict an ever-increasing labor intensiveness.

This Diebold report selected the Hardware Index — the ratio of DP hardware expenditures to DP staff expenditures — as a measure of the labor intensiveness of the DP function. In 1971, this ratio was found to be an average of .69 for 10 industrial groups: for every dollar spent on DP staff, 69 cents was spent on hardware.

Diebold performs this survey and analysis every two years and has found the Hardware Index moved from .69 in 1971 to .74 and then .73 in 1973 and 1975, respectively. Diebold's 1975 study concluded that "the steadiness of the Hardware Index indicates that . . . relative proportions of hardware to personnel spending have not changed. Whatever changes are taking place in the pattern of spending must be in other areas."

We note another anomaly which serves to further undermine Myth No. 1. We already cited from the Silt Report the forecasted lower hardware component as a percentage of total DP spent of about 20% by 1985 in constant ("inflation-proof") dollars. We note the authors' additional forecast of a quadrupling of total DP expenditures in the 1975-1985 decade.

The software component, at 80%, would then have to have a real growth factor of more than 5 — an unlikely possibility in a 10-year period. In fact, such growth would require a threefold increase over the expected 1985 programmer population, according to the growth parameters published by Dolotta et al.

It may well be argued that the com-

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plement of hardware is not just software, but would include data communications, outside services and supplies. Even in this instance, assuming a present 20% cost ascribable to these elements and growing to 30%, we would have the "truer" software component going from 40% to 50%, or in real terms from 40 units to 200 units — this time a growth factor of exactly five. Again — incredible!

Casters of Doubts

At least one author has cast doubts regarding Myth No. 1. M. Phister, in his authoritative work *Data Processing Technology and Economics*, asserted that "the burdened cost of the users. systems analysts and programmers is almost the same as the total value of hardware shipment, plus the total amount paid for data processing services, supplies and communications."

He went further to say that in his belief "the number of systems analysts and programmers per dollar value of general-purpose computers has remained fairly constant."

This view is supported by the data presented by D.A. Fisher in the definitive study of DP costs in the U.S. Department of Defense (DOD). Here the operational and capital costs of the General Management Classification (GMC) category of comptuer systems was analyzed from data obtained from the General Services Administration publication "Inventory of Automatic Data Processing Equipment in the United States Government.

Figure 2 presents an expenditure summary, showing the stability of direct personnel costs, with even a slight decrease in the DOD component from 1968 to 1973. (The personnel costs are unburdened in the source document. Total cost will be examined below).

The balance of U.S. government GMC experience shows a small increase in the percent personnel costs — perhaps reflecting the level of use of outside services during that time frame — contrasted with the pronounced shift to such a service alternative by elements of DOD.

Manpower Leveling

A further interesting observation supports the contention that manpower is leveling off. The DOD study indicated the in-house personnel costs increased in dollar value by 48% in the five-year period 1968-1973, but a correction for inflation would find the dollar change to be negligible. This is primarily the result of a 10% drop in headcount from 1968 to 1973.

Similar observations have been made in a second setting. The June 1977 report of the Japanese Information Processing Development Center stated that in the administrative organization of the Japanese government "until recently, the number of computer personnel has been increasing yearly as a whole," but "the growth rate of the number of personnel is tapering off, registering a decrease as a whole for fiscal 1976."

Software Cost=Personnel Cost?

But can software cost be equated simply to personnel costs only?

Clearly, professional services purchased from the outside are also software costs.

And what about software products which are almost 100% value-added people costs? Or the development and support of the software offered through data services?

And, finally, what about the software from the hardware vendor which, bundled or not, may be buried in the hardware cost itself?

The identification of all people costs as software may well account for part of Myth No. 1. As DP has further penetrated the user environment, more and more personnel are concerned with the computer — from the point of data entry to data output — from training to maintenance. The measurement criteria have become nebulous concerning which elements are counted as DP people costs relating to development and support (software) and which are counted as parts of the user environment (operations).

Even within the DP shop, it is proper to challenge what is "software cost."

(Continued on Page 16)

	INDIVIDUAL DP SITE EXPENDITURES (%)			TOTAL USER EXPENDITURES (%)	
	1973	1976*	1977**	.1974	1977
HARDWARE	40	45	41	38	40
DATA COMMUNICATIONS	6	***	***	7	9
SALARY	45	44	44	34	30
SUPPLIES	6	6	4	4	4
OUTSIDE SERVICES	3	5	11	17	17

* Selecting the $500,000 to $1 million per year hardware rental installation as a typical budget.

** Adjustment made to original data by moving data communications line cost from supplies to the hardware category; this data heavily biased in direction of the largest installations in ten industry sectors.

*** Data communications is included in the hardware category.

Figure 1. U.S. DP Expenditure Breakouts

	DEPARTMENT OF DEFENSE	OTHER U.S. GOVERNMENT
FY 1968		46%
PERSONNEL	54%	13%
EQUIPMENT RENTALS	22%	17%
CONTRACT SERVICES	9%	10%
OTHER OPERATIONAL COSTS	8%	14%
CAPITAL COSTS	7%	
FY 1973		
PERSONNEL	53%	48%
EQUIPMENT RENTALS	16%	16%
CONTRACT SERVICES	14%	17%
OTHER OPERATIONAL COSTS	7%	8%
CAPITAL COSTS	10%	10%

Figure 2. Percentage Distribution of Direct DP Operation and Computer Costs, GMC Systems

ELEMENTS OF COST	DIRECT COSTS	BURDENED COSTS	ADJUSTED COSTS
Software	34%	39%	45%
In-House	25%	33%	33%
Contract Services	9%	6%	6%
Hardware Related	—	—	6%
Hardware	33%	22%	16%
Other	33%	39%	39%
Software as Percent of Hardware Plus Software	51%	64%	74%

Figure 3. Identification of 'Truer' DOD Software Costs (Fiscal Year 1973)

(Continued from Page 15)

For example, one could reasonably separate DP people salaries into at least two components — first, the operation side and, second, the development side.

I would argue that the operational element — including operators, input/-output clerks, standby maintenance personnel — are a necessary extension of the hardware in order to make the application systems perform satisfactorily for the user.

Indeed, it was just such an approach that was taken by Fisher to further analyze the DOD DP cost data cited earlier. In that study, the total direct costs were allocated to three categories — software, hardware and other — with each one of these categories including some labor component.

The software category was comprised of two components — in-house personnel and outside contract service — in an approximately 75%/25% proportions. Here, the definition of what is called software included systems analysis, design, programming, equipment selection and studies.

Fisher made two subsequent calculations on the raw data obtained from the General Services Administration report. First, he burdened all of the DOD in-house labor in all three categories by a judgmental factor of 100%. Secondly, he assumed there was a 35% software cost bundled in the hardware prices.

Results of Study

Figure 3 shows the results of Fisher's study, based on the two steps mentioned above, that redefine software costs starting with the distribution shown in Figure 2. Two observations concerning this DOD data are necessary:

- Personnel costs in fiscal year 1973 were 53% of total direct expenditures (Figure 2). In the burdened model, Fisher cited personnel costs at approximately 70% of total costs (Figure 3).
- Burdened costs ascribable to software range between 33% (in-house) to 45% (adjusted) of total expenditures, depending upon the elements included.

Figure 3 also presents, for each model, the ratio of software, as defined, to the total of hardware and software. This ranges from 51% to 74%, the latter being close to the often-quoted current estimate of U.S. Air Force software/hardware expenditure split. In making this calculation, of course the "other" cost category is omitted.

I would argue that purchased software (i.e., packages) and vendor-supplied software, bundled or unbundled, should not be counted as part of "software" costs. These elements are extensions of hardware — mass-produced — and are not influenced by the same economic factors as are the "custom" services of a specific professional.

Hence, from the data of Figure 3, it is possible to identify as the "software" cost component a quantity taken from the "burdened costs" column ranging between 33% and 39%, say 36% of total expenditures. This would lead to a 62%/38% split between the two elements of *burdened* software and hardware, respectively.

One further quantitative observation is in order. The "true" software component, consisting of systems programmers and application analysts, implementors and trainers, is actually engaged in two main activities: maintenance of operational systems and new developments.

Estimates published by B.W. Boehm in the December 1976 issue of *IEEE Transactions on Computers* suggest that some 60% of this professional software staff may be occupied with necessary maintenance of ongoing operating applications. This would leave roughly only 15% (40% x 38%) of the total expenditures available for new development.

A self-correcting process seems to be in operation which limits the capacity to spend money on "software" be-

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cause of continued budget constraints and the difficulty in recruiting personnel, together with growing maintenance requirements.

Remarkably Stable Costs

This brings us full circle to where we started — challenging the myth of the software behemoth. Two conclusions result:

(1) Current software (personnel) costs are not growing as a componenet of total costs — they are relatively stable.

(2) The popular software/hardware ratios have typically excluded from consideration many other cost elements and, therefore, distort the true portrayal of "software cost" growth.

The facts seem to show that software costs per unit of time are remarkably stable. It is not, therefore, the annual software cost as a percentage of annual expenditures that is taking more and more from the total budget, but rather it is cumulative cost of implementing specific applications as a function of a unit of computing capacity that is increasing — and this cost is stretched out over time and, hence, not readily discernible.

What is the explanation for the apparent stabilization and even decrease of the labor element in the cost picture of DP operations? There may be several reasons:

- The availability of standardized software products and outside data services offered by the computer services industry have done much to hold development costs down and extract more cost-effective results from shared software and hardware.
- The additional hardware capacity and system software sophistication (terminals, time-sharing, data base management systems, et al) supporting application implementations have led to a need for substantially more computer capacity, as well as peripheral and communications equipment, causing the hardware budget to remain the same or even increase, despite the fact that electronic components themselves are becoming more cost-effective.
- The application solutions have become increasingly complex, encompassing more functions and requiring more built-in safeguards. This has resulted in a more demanding hardware environment with a corresponding increase in costs. Digital Equipment Corp. president Kenneth H. Olsen was quoted in the July 28, 1977 issue of *Minicomputer News* as saying, "The reason why there's a software problem is that people always want to do problems just slightly beyond the state-of-the-art.

"With all the prices going down, the average computer we sell has stayed the same price for 10 years, roughly," Olsen noted. "What happens is that even though the computer is cheaper and the memory is cheaper, people just want 10 to 50 times as much memory as they did 10 years ago. That means the problems they're trying to solve grow as fast as the cost goes down, and they still have the same trouble they had 10 or 15 years ago because they're trying to do a little bit more than they can do."

- The dramatic shift to the minicomputer has also affected the traditional hardware/software split. At first glance, the hardware cost decreases would seem to affect the software cost factor. However, in actuality this does not appear to be the case for two reasons:

(Continued on Page 18)

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The minicomputer applications remain simple and it seems less manpower per hardware unit is necessary to support such systems — a point which, at this time, is more conjecture than a result of good industry statistics.

Software for the minicomputer seems to be incredibly cheaper than for the larger computers — again relating, perhaps, to simpler environments and fewer demands made by such installations.

Hence, the wide and often multiple-unit distribution of the mini, coupled with the less costly software, may actually have stemmed the tide of software cost.

In summary, perhaps one subtle influence in postponing the "software cost explosion" is the trade-off noted by Boehm in his May 1973 *Datamation* article: "There are numerous . . . ways in which cheaper hardware can be traded off to save on more expensive software development cost. This trade-off opportunity involves buying enough hardware capacity to keep away from the steep rise in software costs occurring at about the 85% saturation point of CPU and memory capacity."

MYTH NO. 2

Software is (necessarily) expensive.

The cost of software depends upon how it is acquired and how costs are calculated. Certainly, if the classical elements of cost are counted, the software expenditure is dear. We include as components of cost the following:

- Requirements study.
- Feasibility analysis.
- Functional design.
- System specifications.
- Specifying and providing hardware.
- Programming.
- Testing.
- Acceptance.
- Documentation.
- Training.
- Conversion.
- Operation.
- Maintenance.

Not only is each of these activities a people-intensive process and, therefore, expensive, but the steps also take substantial time for completion.

There are additional costs typically not identified at the outset of a software project, such as:

(1) Time and opportunity loss in not having the solution immediately.

(2) Poor estimates leading to project overruns.

(3) Nonmatching of the users' real requirements with what is actually delivered.

(4) Change of the initial environment and requirements by the time the project is completed.

But there is an alternative — and software can be cheap. Certainly cheaper. It all depends upon who builds it and how it is paid for.

If a piece of software is available on the commercial marketplace and if it fits one's requirements — or even *nearly* fits — then current marketplace software prices are a bargain which the user can't ignore.

Not only is the purchaser of commercially available proprietary software able to buy the operating code, but he also gets documentation, training and continual maintenance. He is, there-

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fore, able to shortcut almost all of the tasks identified above and avoid the accompanying pitfalls in implementing software.

Even if the software product is not the ultimate solution, its lower cost makes it usable as a benchmark or test cell for identifying more specific and more customized needs.

Reflect for a moment on the internal manpower costs and displaced profits of an organization which allocates its own best resources in conceiving, defining and architecturally designing the external characteristics of a given computer application solution. The interaction of the in-house user and DP staff — conducting their interactive process of analysis (first three components of cost) over many months — would more often than not equal the purchase price of the off-the-shelf software from outside sources.

In fact, the price of available software can often be justified solely on the basis of the associated documentation which, in itself, can be the starting point, or straw man, for a subsequent internal development.

In other words, one can purchase the package, use the documentation and throw away the code — that's how cheap it really is.

But there is an even more valuable, although frequently overlooked, tangible benefit. By associating oneself in the marketplace with other users of the same software product, one becomes a participant in a community of interest — which, if there are a substantial number of users, will lead to a continually improved and responsive software product.

Application software maintenance has become a sizable — 60% — portion of the programming staff duties. Once again, this troublesome ongoing expense can, to a large extent, be displaced and the cost shared with many users.

Finally, of course, purchased software can mitigate, if not avoid, the downside risks already identified as hidden additional costs of custom implementation where time for completion and the end performance remain unknowns for too long a period.

And to the financially concerned, purchased software can be treated as a capital investment to help the income statement or it can often be leased, if it is a question of cash flow.

Indeed, software need not be expensive.

MYTH NO. 3

Software must follow hardware.

This myth is more often expressed as the hardware leading the software — software must be designed or redesigned to keep pace with the newest advancements in hardware.

The phenomenon is demonstrated by:

- Concern for hardware cost/performance criteria based on internal processing capacity and neglect of the impact on existing software.
- Readiness to upgrade, sidegrade or "downgrade" hardware and accept, as a secondary effect, the need to redevelop existing software for the new environment.
- Acquiring the hardware and then worrying about the effect on the software.
- Allowing the software vendor to be second in line to the hardware vendor.

Implicit in this myth is that standard-

(Continued on Page 20)

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ization should be associated with hardware.

Given the well-recognized, critical path of software development, however, why shouldn't the latter be the standardization point?

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Werner L. Frank is a co-founder and executive vice-president of Informatics, Inc., an independent supplier of custom and proprietary computer software products and services based in Woodland Hills, Calif. He is the author or co-author of 19 published papers on the numerical analysis and development of on-line, terminal-oriented software.

A graduate of the Illinois Institute of Technology and holder of a master of science degree in mathematics from the University of Illinois, Frank spent the early years of his professional life at the Thompson Ramo Wooldridge Corp., where he directed the development of some of the first trajectory and orbit determination computer programs for space vehicles.

At Informatics, Frank has been responsible for the development of several major divisions engaged in implementing military and commercial information systems that emphasize on-line technologies employing communications, data management and terminal devices.

He also headed a team that investigated the feasibility of forming a joint venture enterprise with the Equitable Life Assurance Society to provide software and data services to the insurance industry. Equimatics, Inc., the result, later acquired Informatics and the two merged.

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Editorial

ACM and Soviet Union

The Association for Computing Machinery's (ACM) recent severance of relations with the Soviet Union "until the climate of intellectual freedom [there] clearly improves" has sparked a lively exchange of views between ACM President Herbert R.J. Grosch and one Peter Turk of Toronto that has been published in the February *Communications of the ACM*.

ACM's move was prompted by Soviet treatment of computer expert Anatole Sharansky — jailed since March 1977 without being formally charged with any crime, although ostensibly accused of treason [CW, Dec. 12].

Turk gave three reasons for his opposition to the ACM move. "First, I do not think that politics is a meaningful or useful consideration in science," he wrote in the journal's "ACM Forum" section. "Scientists should not even recognize the existence of politics, let alone enter the arena and become politicians."

Secondly, Turk suggested, the severance only adds to the troubles of persecuted Soviet colleagues, "proscribing them from sharing with us as scientists."

Finally, Turk asked whether the ACM Executive Committee was "qualified to act as judge and jury" in this matter, indicating it may not have had enough information to make a satisfactory decision. For example, Turk noted the U.S. also prosecutes foreign agents and said Sharansky "just may be guilty" of the accusations made against him.

"Unless these questions are analyzed and properly understood, any positive action is irresponsible," Turk said, calling on ACM to retract its decision.

Grosch responded to Turk in a letter in the journal's "ACM President's Letter" section. "Your first point is so unrealistic as to be ludicrous," Grosch told him, noting that scientists are involved in politics on a daily basis — within organizations, applying for budget support, trying to secure space in refereed publications — "precisely because science cannot exist in a social vacuum."

Grosch met Turk's second point by asserting that dissidants who have left the USSR have applauded moves such as ACM's and that "a scientist who works for a government, an industrial concern, a research institute that does evil things must share the obloquy, the shame his organization earns.

"Of course we acted hastily," Grosch said in rising to the third point. Sharansky "is in danger of execution, of induced insanity, of a concentration camp . . . "

There are two ways to take the assertion that science should be divorced from politics. One way, perhaps the way Turk meant and surely a way that Grosch has ignored, is that scientific deliberations must be free of any political bias. Hence, short of a meteorological application, the study of thermodynamics does not entail a concern with hot air over the Potomac.

However, many scientists are liable to be tools for evil unless they consider the propriety of their work and the motivations of those who subsidize it, as Grosch is well aware. Many computing professionals, for example, work for organizations in the public and private sectors that are supportive of political regimes long associated with human rights violations.

Turk's second point does have merit and we stand by an earlier editorial [CW, Jan. 16] in support of the appraisal of this issue by the Association of Computer Programmers and Analysts (Acpa).

Acpa has called for keeping open the lines of communications and using them to protest human rights violations while retaining a supportive link with oppressed Soviet colleagues.

Turk's third point is also well-taken, although there seems no indication that ACM members did not take it into account as they voted to sever relations.

Soviet repression, particularly as it has been applied to Sharansky, requires urgent attention and swift action, as Grosch pointed out.

Data Past

Five Years Ago
March 7, 1973

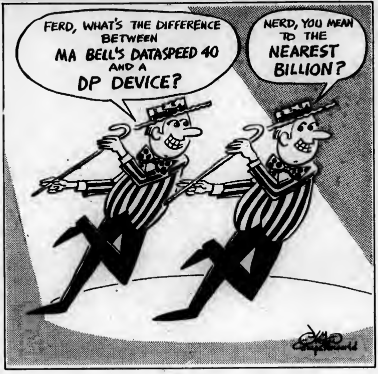
NEW YORK — Peat, Marwick, Mitchell & Co., a major auditing firm employed by several large third-party leasing firms, reappraised its policies on residual values of IBM 360s and related peripheral equipment, according to its Management Information Letter 1973.3. The letter said third-party lessors must reduce the asset value of 360 equipment and peripherals to zero not later than Dec. 31, 1978. At the same time, the value of all enhancements should also be totally recovered, the letter noted.

Eight Years Ago
March 11, 1970

WASHINGTON, D.C. — The Patent Appeals Court ruled that software methods, rather than just a process, could be patented.

— — —

FT. HOLABIRD, Md. — With much fanfare, the U.S. Army abandoned its computerized data bank on lawful civilian political activity, but failed to report that a microfilm data bank with a computer-produced index, apparently containing much the same information, was still in use in the Pentagon.


FERD, WHAT'S THE DIFFERENCE BETWEEN MA BELL'S DATASPEED 40 AND A DP DEVICE?
NERD, YOU MEAN TO THE NEAREST BILLION?

Letters to the Editor

What's a Company to Do?

Some observations:

- If IBM charges higher prices than its competition, the end-user is the victim of unfair monopoly practices.
- If IBM charges lower prices than its competition, it is engaging in restraint of trade.
- If IBM charges the same price as its competition, then they both go to jail for price-fixing.

Question: under law, what should IBM's prices be?

Question: Since when does the law dictate pricing policy?

Suggestion to IBM: Quit being so successful and everyone will leave you alone.

John J. Enright Jr.
Kew Gardens, N.Y.

Record Deserves Correction

In "New Body Urged for Regulation of Data Flow" [CW, Feb. 27] my remarks in Brussels were misreported. Among other minor deficiencies, the article concluded that I was urging international tariffs be based on "volume and not the cost of leased lines." Wrong.

What I specifically urged was that each nation's international rules and regulations, tariffs, standards and laws be harmonized; and that each state's tariffs be cost based — one nation with another. Of special significance, I said, "We need agreements that will preclude prohibitive tariffs which would subject shared private-line systems to cost schedules based not on the cost of the line but on a volume-sensitive per-message basis."

John M. Eger
Washington, D.C.

Missing Ingredient

Barry Starkman stated he graduated from a university with a DP degree ["Any Advice for DP Grad?" CW, Feb. 13], but failed to say whether his education including programming (in what languages), computer operating, system design, etc. The rest of his article showed, by his constant referral to "entry-level, beginning computer programmer, training programs for beginning programmers," etc. that he was defeated before he went in search of employment as a programmer.

My education in DP ended with a certificate from a technical school, showing I had completed the required courses in unit record, system design, Cobol, BAL and RPG. However, most importantly, I was taught that when I graduated I would be a programmer.

I sincerely believed that and within three months after graduation had received four job offers.

I suggest Starkman visit with some placement directors and look at their records. In my opinion, Starkman is the exception, but it may be that self-confidence is not included in a university education.

Fred Erdtsieck Jr.
Orange, Calif.

Not Mutually Exclusive

The authors of "Once for Designers, DBMS Now Keyed to User" [CW, Feb. 6] implied that Codasyl data base systems and inverted indices within the data base management system are mutually exclusive.

Our IDMS implementation closely follows Codasyl specifications and contains full inversions for sequential processing and secondary indices.

We find the Codasyl specifications give Cullinane, as an implementor broad freedom in the inclusion in our system of both list processing and pointer arrays or inversions.

Thomas F. Meurer
Senior Vice-President
Cullinane Corp.
Wellesley, Mass.

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Detach here, fold, and place in post-paid envelope attached through binding.

Masters at Obfuscation

Too Much Jargon Hurts DPers' Credibility

By Jack Stone
And Ida Mason
Special to CW

Mark Twain once said, "There are lies, damned lies and statistics!" If he were alive today and examined the human communications of the computer center, he'd probably comment, "There is data processing parlance, 'computerese' and jargon!"

Have you ever thought about how the excessive use of technical terminology not only tends to confuse the facts in the mind of the reader or listener, but, much worse, reduce the credibility of the DP writer or speaker?

A classic demonstration of just how ridiculous supposedly scientific people can become was recently analyzed by Theodore Levitt, writing for the *San Francisco Chronicle*. A professor of business administration in the Harvard Business School, he commented on a recent survey regarding the relative standing of his institution in the community — a subject of clear and present interest to him.

The survey, as reported in a prestigious business journal, polled 85 business school deans. It concluded that the Harvard MBA program, top of the line for more than 50 years, was toppled from its exalted throne by the upstart West Coast — if it can be imagined — Stanford University Graduate School of Business.

Using an elaborate scoring system, the survey team calculated that Stanford trounced Harvard 4.9487 to 4.7692. Furthermore, reported standard deviations of 0.22200 and 0.55650 tried to add respectability to the findings, an action which, of course, could not influence the astute reader who knows one (1.0000) or two (2.0000) things about such matters.

Prof. Levitt is justifiably concerned about the impact of such absurdities on John Q. Public (you know him as the non-DP-oriented user) when they are couched in a glowing technical aura. He points out, "If something is literate, reads easily and makes obvious good sense, then obviously it's only pop. No substance. If it's written in the universal foreign language of integral calculus, that's high-quality substance."

The plain fact is that DPers are masters at obfuscation, except when talking among themselves and, even there, I have some doubts. Are DPers deliberately trying to cloud issues or bury facts, perhaps to shroud their ambitions or inadequacies? Personally, I don't think so. I truly believe our people are so busy trying to handle current workload they don't take the time to focus on their communications inadequacies.

But certain psychologists don't agree with me. They have written that the use of jargon is a basic and understandable human trait. They claim jargon is used as a means of succeeding by not simplifying. They also say there are two characteristics of human nature that cause people to be impressed with those who use specialized language, at least in the short run.

The Human Connection

'Zeigarnick Effect'

The first of these traits is called the "Zeigarnick Effect" (after its discoverer) and it says people are more aware of unfinished or incomplete ideas or things or tasks than finished ones. (Note that we used the term "aware," not "understanding.") Thus, unanswered questions or voids in knowledge create a kind of mental tension which, according to this theory, causes such uncertainties to be remembered. (Note that we used the term "remembered," not "appreciated.")

The second characteristic is this one: Goals difficult to attain are more highly valued than goals that are less difficult — people want what they can't get. This theory, when applied to the DP milieu, suggests that when access to the programmer and the computer is always something of a chore to the user, then computing services will be a highly prized commodity.

Unfortunately, these psychologists, assuming they're right, don't go far enough. They only address Stage I of what I call the "jargon jolt," the process by which John Q. User gradually loses respect for the computing department. In this first stage, young John is excited, if not bewildered, with the jargon which seems to imply a vast mental apparatus of the DPer: "That guy is so smart nobody can understand him!"

During Stage 2, maturing John becomes disenchanted and discouraged when he finds what appear to be evasive attitudes during questioning periods: "Do you know, I can't ever seem to get a straight answer from my programmer!" In Stage 3, aging John becomes bored with the technical terms and breaks off communications: "The only reason I see for having a DP organization is that our competition has one!"

Are you guilty of "jargon jolting"?

Ida Mason, a professor of DP at Lehigh (Pa.) Community College, is currently on sabbatical doing research on women in management.

To Layman's Advantage

DP Methods Would Produce Clearer Wills

In light of recent developments concerning malpractice and data processors, I have been looking at the way other professionals — particularly lawyers and doctors — operate and how DP could change their practices. In future columns, I will discuss some aspects of my investigation. This week, I'll deal particularly with what may soon be in store for lawyers and their clients in drawing up wills.

The Taylor Report
By Alan Taylor CDP

Standard Wording

If there is anything standard in the law, it is the way certain phraseology survives, especially that used in wills. These documents obviously can, and often do, pose serious problems in clarification when the time comes to use them. In addition, they are often subject to many random changes over long periods of time.

The legal profession has developed a number of standard forms, such as the one shown at the right intended to reduce the number of mistakes made in preparing a will.

For instance, many wills have caused confusion because more than one form of a name has been used to identify some party involved, so special wording has been introduced to avoid that confusion. Use of "the same," for instance, ties the first reference to Mary Smith to some later reference, without ambiguity. And designations such as "testator" and "executrix" prevent mistaken references that could result from copying errors.

Some portions of the form are included as optional paragraphs, such as the articles dealing with medical and funeral expenses and bonding of executors shown in the figure.

The result of these error avoidance techniques is a loss of understanding by the layman. People simply don't call each other testators or executrices. In addition, DPers have learned that people respond better to forms in which information is requested by a direct question, instead of through incomplete statements.

DP Improvements

While the old methods for avoiding copying errors result in loss of understanding (lawyers may be feathering their own nests), DP techniques would certainly provide more efficient copying. Really, the whole thing is like the personalization of a form letter after a series of parameterized inputs. Repeated use of name and address in the body of a computer-produced letter is easily understandable and effective. Similarly, the repeated and accurate use of a person's name would make wills more readable.

The figure at bottom right shows a questionnaire form that would permit a computer to produce an understandable will.

In fact, this technique could become standard as soon as the legal profession catches up with the computer — or will-makers catch up with and overtake the legal profession.

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LAST WILL AND TESTAMENT
OF
____

I, ________ of ____ County, Pennsylvania, do make, publish and declare this instrument to be my Last Will and Testament. This instrument revokes all other Wills and Codicils heretofore made by me.

ARTICLE ONE

I direct that all the expenses resulting from my last illness and funeral be paid from my estate as soon as practicable after my death.

ARTICLE TWO

I bequeath all of my property, real and personal, to
____

ARTICLE THREE

In the event that my ____ should predecease me, or in the event of our mutual demise, I bequeath ________________________
____

ARTICLE FOUR

I appoint _____ as Execut___ of my estate. In the event that _____ is unable or unwilling to so serve, as Execut___, I appoint _______ as Execut___ of my estate.

No Executor nor Executrix serving my estate shall be required to post bond to so serve.

IN TESTIMONY WHEREOF, I _____ have hereunto subscribed my name to this will, this ___ day of ____ 19__.

Above: Standard format. Below: For computer Input.

Name? ________________________________
Address? ______________________________
What previous wills have you made? ______________
Medical bills in some accident cases can cost many thousands of dollars. Would you want such bills to just be paid, whether or not they are legally called for, before any of your property is distributed?
_______ Yes. Pay bills anyway.
_______ No. Let law decide if justified.
_______ Don't know.
If one person — your wife, husband, son, daughter or whatever — is to have all that you leave, who is it to be? ______________
Relationship ______________________________
If that person dies at the same time, or before, who should get it all?
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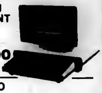
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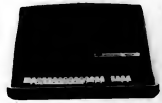

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Letters to the Editor

Facts in Some Articles Grossly Misrepresented

Computer Network Corp. (Comnet) must comment on "FBI Stands Behind Use of OS/MVT by NCIC," [CW, Jan.16] and other previous *Computerworld* articles dealing with data security in which the facts are grossly misrepresented.

The article stated that regarding the Navy request for proposal for computer time-sharing services, "... The Controller General told the Navy it could not accept a [Comnet] proposal that OS/MVT be used as the basis for the time-shared personnel record system." In both his Jan. 13, 1977 and June 13, 1977 decisions, the Controller General clearly emphasized the real issue was not whether Comnet *hod* the required security, but rather whether its proposal adequately described its security.

It should also be emphasized that Comnet's Alpha system is an extensively modified OS/MVT operating system, not to be confused with IBM's OS/MVT. It is well-known in the industry that an unmodified OS/MVT system does not satisfy government Privacy Act requirements.

CW further interpreted the Controller General to have concluded that with the Comnet system "The Navy would not have been able to prevent a user's program from accessing areas of main memory outside the user's assigned segment." However, on Jan. 23, 1978, the Controller General closed its file on the case and repeated its position:

"The central issue dealt with in our two previous decisions concerned the reasonableness of the Navy's evaluation of the Comnet proposal... This is a different issue from the question whether a contractor's performance of a contract complies with the requirements of the solicitation."

L.E. Johnson
President
Computer Network Corp.
Washington, D.C.

Firm Wasn't Bankrupt

"Bankrupt Key-to-Disk Maker CCI Rebounds" [CW, Dec. 5] was a reasonable reflection of our interview, except for the reference to bankruptcy and an incorrect and misleading headline.

Consolidated Computer, Inc. has never declared bankruptcy, but technically went into "interim receivership" six years ago, recovered with government support and has been in business ever since.

Peter C. Baines
Vice-President
Corporate Marketing
Consolidated Computer, inc.
Don Mills, Ontario

Premise Was Unsound

The editorial "There Must Be a Better Way" [CW, Feb. 6] said "... standards are needed because ... users are spending more than is necessary ..."

I submit that neither that premise nor the implied conclusion that government regulation could result in reduced user costs is sound. Support of the idea that government (a user) is entitled to mandate standards on the basis of saving taxpayer's dollars should follow careful factual observation.

If the first premise is a fallacy, then subsequent deductions are in danger and there would be no retreat.

Frederick C. Harwood
Great Barrington, Mass.

Ain't No Such Thing

In the Feb. 6th issue you were kind enough to publish my letter ["Poor Statistical Methods"] taking issue with your analysis of user preference among various vendors. Your editorial note states that the size of the sample responses represented the same percent of each firm's customer base, thereby validating the findings.

While I am not, and do not pretend to be, a statistician, I did receive a crash course in sampling from Dr. James Lorie of Chicago University's School of Business some years ago. One of the things he taught me *first* is that "there ain't no such thing a percentage sample.' "

Permit me to illustrate. Given a dish containing 10 marbles, each of a different color, close your eyes and select at random any one — e.g., a 10% sample. Can you now say, with a clear conscience, "I have 95% confidence that every marble in the disk is identical to the color I selected?" Of course not — the universe is too small. For this problem, a 50% sample might give you 60% confidence (there are special means for arriving at the parameters of the problem).

On the other hand, it is theoretically possible to properly sample what is effectively an infinitely large universe, providing that a perfect random sample can be drawn. Since this is a practical impossibility, nothing being perfect, comprises are made. Yet Neilsen samples the TV viewing taste of the entire country with about 1,200 families in his sample.

If we pretend that the IBM computer customer base is 20,000, the sample "percentage" (1,291 units) is 6.46%, yet a properly drawn sample of the same size can represent the entire U.S. population. Conclusion: sample is large enough (no comments as to selection, no information given).

If we apply this same "sample percentage" to the Amdahl sample and calculate the size of the universe, we find slightly less than 109 customers. Seven respondents, no matter how carefully selected, cannot represent 109 elements of a universe. Try it with the colored marbles.

R.E. Kaufman
Saratoga, Calif.

TU-BE OR NOT TU-BE

Alas, poor Yorick, his program won't run.
It went down the tubes at a quarter to one.
When called to explain why his run had exploded,
He couldn't be sure they had run what he coded.
Did they mount the wrong file, or have bad JCL?
He needed hard copy in order to tell.

For although console messages flashed on the screen,
The one guy who needs them was far from the scene.
Alas, poor Yorick, faced another long wait.
They couldn't dump DOCS till a quarter past eight.

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Of waiting around for that printlog utility,
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RT-11 Updated

Model Finds DP Management Flawed

By Don Leavitt
CW Staff

PHOENIX — A growing awareness of the need for performance management within the DP environment has resulted in an expansion of the scope of performance-related activities, according to independent consultant Barry A. Stevens.

In the January issue of *EDP Performance Review* (EDP/PR), Stevens described a pragmatic model of a DP organization on which a workable performance management system can be based. He also described the results of applying the model in four different organizations and showed how practices were identified that had resulted in weakened control over data center performance.

Stevens' performance management system is a closed-loop process encompassing all the major DP functions; planning, development and operations. User requirements are the process' primary stimuli.

Planning translates those requirements into hardware and personnel resource requirements adequate to meet service levels on which the user agrees. Both development and operations provide feedback to the planning function — development on new applications and their projected workload impact, operations on current workload and service levels, Stevens explained.

User Interface Weak

In recapping what happened when the model was fitted to a "live" situation, Stevens said he found the user interface, so critical to the whole process, was poorly handled. Agreements between users and DP were "usually incomplete," user contact points were "neither clearly nor completely defined" and reporting of performance to users was "inadequate."

In the planning function, although work plans existed, their creation and content could be improved, Stevens found. In general, service levels for operations were incompletely specified and, with poorly defined service levels, users were relatively free to demand service without fear of financial consequence, he noted. Even more serious, service levels for development "were not specified at all," the consultant reported. This resulted in a set of unrealistic, implied service levels for development "in which 100% of all projects were expected to be on time and on budget," he continued.

Realistic Objectives Needed

Without realistic objectives for the development function, it is difficult to gauge its actual performance, he pointed out, "and a rational approach to its management is nearly impossible."

Stevens noted later that overcoming the technical problems brought to light by a model-based review of an installation would be a serious but "not insurmountable" task. More difficult would be resolving the psychological problems inherent in changing almost any organization.

Changing management style, for instance, requires people to "fix the problem, not the blame" and to look at performance evaluation for "measurement, not punishment," he said.

Single issues of EDP/PR cost $5; an annual subscription to the monthly newsletter is also available for $48 from the publisher, Applied Computer Research, P.O. Box 9280, Phoenix, Ariz. 85068.

Software Boosts HIS Level 64

WALTHAM, Mass. — A broad sweep of software products was introduced by Honeywell Information Systems, Inc. as part of its introduction of the remodeled Level 64 line.

Multiprogramming support has been sharply increased in the enhanced Gcos operating system. It now can process up to 10 batch, 10 interactive and four output writer jobs concurrently, the earlier version could support five batch and/or communications jobs, a spokesman noted.

The Level 64's communications support has been enhanced to permit connection of IBM 3741 terminals and HIS Level 6 minicomputers operating in a data entry facility, he added.

Interactive Facility

The Interactive Text Editing and Operations Facility, adapted from the Level 66 environment, allows terminal users to create, update and maintain files containing source programs, job control language, user data and job results. Unlike Gcos, whose cost is bundled into the hardware price tag, this facility costs $332/mo.

Details of HIS' Level 64 hardware offerings are on Page 39.

The Level 64 Cobol compiler ($87/mo) has been enhanced by the availability of an implementation of the Report Writer module for an additional $37/mo. Software supporting the Report Writer or Cobol in a communications environment costs still another $91/mo, the spokesman reported.

Data Base Link

DM IV-Entry, another adaptation from Level 66, combines the capabilities of TDS/64 and IDS/II to permit access to a centralized data base in a transaction-driven environment. Cost? $634/mo.

Application software for the Level 64 includes packages for the manufactuirng and distribution industries as well as generalized Financial Management Systems that can be used in various industries, according to HIS.

Net Installs Its APL on User 370s

TORONTO — IBM 360 and 370 users faced with choosing between running all their APL work on a remote-computing network or using one of IBM's APL systems now have another alternative. They can install Sharp APL, from the I.P. Sharp Associates network, on their own in-house CPUs.

The Sharp system — including a language processor and a "highly modified" version of IBM's DOS — is being made available because the network recognizes the pressures, often economic, that makes users feel they have to leave a network and go in-house, a spokesman said.

The current packaging includes all the facilities available on the network implementation, he continued, citing large APL workspaces, file handling, output formatting and enhanced means of sharing variables.

Switch to Net

Continuous maintenance was another feature he emphasized. By keeping in-house Sharp APL users always current with the software installed on the network, the vendor enables them to switch work over to the network without change, whenever the need arises to have the system available to remote company locations, the spokesman explained.

Sharp said it may develop comparable systems under IBM environments including VM, MVT and the SVS/MVS versions of OS/VS2. The current systems runs best in a dedicated CPU — "we recommend a minimum of a 1M-byte IBM 370/138 with DASD, two tapes and a 3705 communications controller."

the software package carries a $100,000 installation fee plus $300/mo as a license fee and $2/hour connect time as a usage fee.

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- CICS/VS APPLICATION PROGRAMMING (Command Level)
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Managing People Problems
• Keynote Speech: Given by a recognized expert in data processing personnel management • Case Studies: Career Pathing for Operators and Programmers, Improving the User/DP Relationship • Presentations: Testing for DP Competence; Coping with Security/Privacy Regulations.

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COMPUTER CARAVAN'S

Enhanced 'Seed' Backs Dynamic Data Changes

PHILADELPHIA — An enhanced version of Seed, the "Codasyl-type" data base management system (DBMS) from International Data Base Systems, Inc., supports physical data base expansion on a dynamic basis, according to a spokesman.

A utility program to provide statistics on data base use is also part of the Seed package, he added.

Seed's dynamic growth feature is said to permit each data base area to expand beyond its initially specified physical limits. Instead of overflowing onto the next storage page when one is filled, Seed allocates another page and chains it to the appropriate area.

The technique, the vendor claimed, has three primary benefits: design flexibility is increased as original parameters become "soft limits"; crowding is alleviated as the data base becomes data-determined rather than preset; and the system efficiency may improve as overflow accesses are reduced.

To provide the user with maximum flexibility, the Seed designers allow the dynamic growth feature to be specified in the schema data definition language on an area-by-area basis, the spokesman added.

The utility program that provides physical data base utilization statistics, DBSTAT, summarizes — for each area and for the entire data base — the percentage allocation for data, pointers, system overhead and free space.

Seed supports both Fortran and Cobol host language interfaces in addition to DBLook, an interactive data manipulation language. The DBMS has been installed on IBM 370, Control Data Corp. 6400 and Digital Equipment Corp. Decsystem-10 mainframes.

The package has a basic cost of $8,750, the vendor said from the third floor at 3700 Market St., Philadelphia, Pa. 19104.

'OLP' Provides DOS User With On-Line Programming

LANHAM, Md.— The On-Line Programming (OLP) system, recently introduced by ABC Data, is said to be a general-purpose text-editing system that allows IBM 360s and 370s running under DOS to support local and remote on-line programming activities.

OLP consists of a combination of on-line application modules executing under a suitable teleprocessing monitor; batch application programs executing in stand-alone form; and system programs and procedures for initialization and maintenance of the system, a spokesman explained.

The on-line application modules control the entry, modification, deletion, verification, duplication, arrangement and replacement of text; communications with the computer operator; and manipulation of system files used during batch processing, he added.

Batch application programs are available to load and unload individual users' text files. Batch procedures for executing job streams created by the on-line modules are provided.

In the on-line mode users may therefore create and alter text which may then be submitted to batch queues for compilation or execution, the spokesman said. Results of these jobs are directed to other batch queues from which they can be retrieved for review, modification and resubmission or processed as conventional batch output.

OLP is said to require minimal main memory — 45K real — to work with dial-up voice-grade lines, to use common file access methods and to support a comprehensive security system.

The package is distributed in source code or machine-readable form for a one-time license charge of $1,800. Installation, customizing and education support is available at extra cost, ABC said from 8601 Brae Brook Drive, Lanham, Md. 20801.

'Psam' Outperforms Isam In DOS, DOS/VS Settings

BROOKFIELD, Conn. — Described as a replacement for IBM's Indexed Sequential Access Method (Isam) support, Psam from Universal Software, Inc. (USI) is said to provide IB, DOS and DOS/VS installations with improvements over the IBM software.

System throughput improvements ranging from 30% to 50%, depending on how heavily Isam is used in the system, are claimed for Psam by the vendor. Disk space savings in excess of 10% over Isam files and "significant reductions" in disk I/O activity are additional benefits, USI said.

Psam is said to incorporate all the facilities of Isam "and more." It includes a multipartition feature that supports "extreme" multiprogramming flexibility by allowing concurrent retrieval and updating of a file from several partitions with no danger of record or file destruction.

A "significant" design consideration of USI's access method is its simplicity of implementation and transparency of use; in most cases, it can be used without recoding, a spokesman stated.

An Isam-to-Psam interface module is included, allowing the user to create and access a Psam file with existing Isam-oriented application programs.

Psam is operational on all releases of DOS and DOS/VS, supports all Direct Access Storage Devices (DASD) and interfaces with all IBM-supported languages. It is available now on rental at $350/mo.

USI is in Brookfield Office Park on Rt. 7, Brookfield, Conn. 06804.

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Nets to Link

KANSAS CITY, Mo. — United Computing Systems, Inc. (UCS) has signed agreements with Fides Computer Center of Zurich, Switzerland, that will link the data communications networks of the two companies by year-end.

The linkage will provide users in major Swiss cities, as well as those in Frankfurt, Dusseldorf, Munich and Stuttgart, West Germany and Madrid, Spain, access to UCS data centers here and in London.

Fides will support UCS clients in Switzerland, West Germany and Spain, while the American firm will reciprocate for Fides customers in the U.S., Canada and the UK, UCS noted from 2525 Washington, Kansas City, Mo. 64108.

On-Line Monitor Packages Bow

• *'Tolar' Shows CICS Usage*

ATLANTA — The Terminal On-Line Availability Reporting (Tolar) package from Trusco Data Systems is a data gathering system designed to operate with IBM's CICS/VS communications software, according to a spokesman.

The data gathered is processed in a batch environment to produce reports showing, for example, the amount of uptime and how the system capacity is being used and by whom. Peaks affecting response time and "bottleneck" transactions are also highlighted in the Tolar output, he said.

The system can also show how CICS costs are allocated to on-line users. Touching on all these areas, the reports will show areas that need to be addressed to overcome any availability problems, the spokesman continued.

Tolar reports on a maximum of 24 CICS applications. For each terminal-oriented task, it captures elapsed task time, task CPU time and task start and stop time. It also marks each record with operator, transaction and terminal identifiers, Trusco said.

Tolar also has an on-line response time monitor, an Assembler program that functions as a CICS transaction. It is activated every five minutes and compares the average transaction life of all departments with a table of predetermined standards of acceptable response times.

If a department is experiencing less than acceptable times, a message is generated on the CPU console warning of the degradation, the spokesman said.

Tolar is designed to operate in a 24-hour-a-day production environment with automatic file switching at midnight, he added.

The package — including Cobol and Assembler source code — is available under a perpetual license agreement for $5,000.

Trusco Data Systems can be reached through P.O. Drawer 4418, Atlanta, Ga. 30302.

Interdata Users Reach 'Summit'

TUCSON, Ariz. — The multiterminal manufacturing control system called Summit, from Diversified Data Systems, Inc. (DDS) is said to provide support for small- to medium-sized companies equipped with Interdata, Inc. 7/32 or 8/32 computers.

The basic package supports 32 terminals with optional support available for another 32, a spokesman said. He added that the system provides on-line order entry, editing, processing and inquiry for customer orders, purchase orders, repair orders and internal subassembly manufacturing orders.

Categorized as "especially well suited" to electronics manufacturing companies, Summit provides a bill of materials module and a flexible system for determining inventory requirements for production scheduling, the spokesman added.

The system also provides comprehensive inventory control and management, he claimed, adding that cost accounting by individual order is also available from the package.

The Summit software provides an interface with DDS' Integrated Business Accounting System (Ibas) for such applications as accounts receivable, accounts payable, payroll, fixed asset accounting and general ledger. The Ibas package is supplied as part of the Summit system, DDS noted.

Cost of the Summit package — which is written in Cobol — starts at $49,500 and includes the vendor's Ibols/32-Oasis software, on-site training, installation and implementation supervision and the Ibas routines.

DDS is at 2601 N. Fairview Ave., Tucson, Ariz. 85705.

• *'Control/IMS' Goes 'Live'*

SUNNYVALE, Calif. — Maintenance personnel no longer have to wait for users to report a slowdown before they are aware of a problem under IBM's Information Management System (IMS). Performance information about various IMS services is available on-line with the Control/IMS Realtime software from Boole & Babbage, Inc.

Accessed from a CRT terminal, the package is said to provide data on 23 informational and five functional services that are useful in finding and isolating problems as they occur; and to provide statistics on IMS activity since restart.

Activity in up to eight dependent regions can be concurrently displayed, enabling personnel to see which regions are idle or being scheduled, which application programs are active, how much work they have done and what they still have to do, according to a spokesman.

This helps isolate such problems as program loops, scheduling failures, response time degradation and multiple-virtual storage (MVS) swapping, he added.

Control/IMS Realtime can also investigate all functions and resources of the IMS that might develop bottlenecks, displaying the address of such major IMS functions as MFS, queuing, scheduling, dependent region activity, data base access and MVS activity, the spokesman continued.

The package operates in the IMS control region of the memory, requiring no changes to IMS modules, he said.

Control/IMS Realtime costs $7,500 when purchased with the firm's batch-oriented Control/IMS; or $9,000 stand-alone, from 510 Oakmead Pkwy., Sunnyvale, Calif. 94086.

Logistics Systems Modeled With 'DLS'

HOUSTON — The Dynamic Logistics Simulator (DLS) from Lowell-Welter Associates models the operation of storage, transportation, supply or "any other type" of logistics system which incorporates movement of materials that may be switched or components that may serve multiple purposes at different times, a spokesman said.

Written in Fortran for use in interactive or batch modes, the package enables its users to develop a logistics facility from the basic design step to the expansion stage. It also helps to plan for expansions, contingencies or for the effects of surges in supply or demand on the facility by developing operating scenarios, he said.

Through the DLS capabilities, the user can operate the logistics facility, tuning it and determining component sizing, bottlenecks and danger conditions by testing the effects of different policies, designs, demands, supplies and operations.

No DP experience is required to use DLS, which can be acquired for $9,775 or $375/mo for six months.

The vendor can be reached through Box 1597, Houston, Texas 77001.

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Seminars Stress People's Role in Systems Work

NEW YORK — "People: The Secret to Effective Systems Analysis" is the title of a seminar to be presented in three cities later this spring under the sponsorship of the Institute for Professional Education.

This seminar provides pragmatic methods of performing the analysis portion of a systems study, according to an institute spokesman, who noted that many systems fail because they provide efficient solutions to the wrong problems.

Three-Day Course

The focus of the seminar is on the development of interpersonal abilities for the systems professional to enable him to perform more effective analysis. The three-day course is taught by Ken Burroughs, senior systems analyst with the U.S. Chamber of Commerce.

Specific topics to be covered by Burroughs include a review of the interviewing process, leadership in the analysis function and creativity in the analysis process. Discussions of systems presentations and the makeup of a successful systems person will be followed by sessions on speaking, listening and writing effectively.

The course is intended for analysts, DP managers, project managers and other professionals involved in the design and implementation of information systems. Current involvement should be considered a prerequisite for attendees, Burroughs noted.

The $425 seminar will be presented in Washington, D.C., on April 24-26; San Francisco on May 24-26; and New York City on June 21-23.

More information is available from TSI Sales and Marketing, Inc., 19 W. 44th St., New York, N.Y. 10036 or from the registrar at the institute, 1901 N. Ft. Myer Drive, Arlington, Va. 22209.

Package Generates Lists or Labels

BRIDGEWATER, N.J. — A package allowing users of Digital Equipment Corp. PDP-11/V03s to build and maintain name/address-type files and to assign codes to individual entries on the file is now available from Unitronix Corp.

The Label software also enables the user to select entries from the file based on the assigned codes and to print them as lists or labels for mailing or personal identification.

Unitronix suggested a number of possible applications, including coding clients by purchased product type; geographic coding of clients; sales prospect status coding — such as "long term" or "waiting for a new product"; and alphanumeric listing of clients/clients' addresses.

Label .runs under DEC's RT-11 environment and requires 20K words of main memory, DEC's LA36 or LA180 line printer and the VT52 display terminal. The software sells for $500, according to Unitronix, which can be reached through P.O. Box 6515, Bridgewater, N.J. 08807.

'Micos' Updated for DG Novas

ELMSFORD, N.Y. — Just announced by Mini-Computer Systems, Inc., Release Level 10 of the Micos business-oriented operating system for Data General Corp. Novas is said to include a variety of enhancements.

The update includes, for example, support for remote program development through a command that can connect Micos-controlled terminals with a source program stored in the CPU. Other features improve execution of programs and the spooling of printed output, a spokeswoman said.

An asynchronous version of the Mtam communications package allows telephone ties between two Micos-based systems.

A newly implemented command gives the Micos user a more detailed accounting of how memory is employed.

Mini-Computer Systems is at 525 Executive Blvd., Elmsford, N.Y. 10523.

'Design Only' Chops Price Of Scheduler

DALLAS — Although Data Index, Inc. still distributes the source code of its Scheduler package to any IBM 360 or 370 installation that pays the appropriate license fee, the vendor now says it will provide the detail design and instructions in theory behind the package — leaving the coding to the user — at a much lower cost.

Scheduler is basically a project management system, maintaining files on projects that are underway and generating detail and summary reports showing project progress. A complete audit trail of development decisions is provided.

License fees for ANS Cobol are $3,300 (DOS) or $3,800 (OS), while the "design only" alternative — which includes all layouts and cross-referenced discussions — is available for $299, the company said from 11300 N. Central Expressway, Dallas, Texas 75243.

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The guide is in updatable format and manual owners will be informed of subsequent page replacement/additions and expansions, as they are released by TelTech.

Each guide is priced at $45.00 plus $2.00 for postage and handling. If check is sent with order, TelTech will pay postage [redacted]

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IBMer: Equipment Mix the Goal of SNA

By Ronald A. Frank
CW Staff

WASHINGTON, D.C. — The primary purpose of IBM's Systems Network Architecture (SNA) is to ensure that a range of terminals and cluster controllers can be intermixed in a network, according to Paul Lindfors, manager of communications systems architecture at IBM.

Speaking at a session on networks at the recent DataComm 78 conference here, Lindfors said such intermixed nets will be driven by common support programs in multiplexers and host IBM 370 CPUs.

"It is recognized that there are many operational networks based on older, non-SNA equipment which are and will remain cost-effective for many years. The ability to allow such networks to coexist with an SNA network is an important requirement satisfied by emulation," Lindfors said.

As customers add applications or make major modifications, it is hoped this will be done using SNA, he added.

Concentrate on Interfaces

Another speaker, Anthony Lauck, chief architect of distributed computing at Digital Equipment Corp., noted the layered concepts used in today's communications architectures have been made possible with the use of microprocessors. But, Lauck contended, there has been too much emphasis on protocols; more attention should be given to interfaces.

One of the difficult tasks still facing designers is to translate communications architectures into CPU environments to allow for compatibility, he added.

In the standards area, the lower levels of the architectures have been defined, but work is just now starting on standards for higher levels, Lauck said. Among these higher level implementations are support for data base functions.

Work is under way to tie Decnet into other protocols and architectures such as the X.25 standard now being used by several public packet networks, he said.

Touching on the emergency of public data networks, Lauck said "each of these new data networks presents a challenge to network architectures in terms of adaptability to specific interface requirements. It is clear that without a solid architectural base on which to proceed, adaptation to these new services would be difficult."

While it would be desirable to have SNA interface to public data network standards and other architectures, IBM's Lindfors said, he gave no further indication of what interface capabilities will be provided for SNA users.

Stores Tied Into Network

POS Keeps Colonel's Chickens Counted

LOUISVILLE, Ky. — If you buy a drumstick from a Kentucky Fried Chicken (KFC), store in Des Moines, Iowa, KFC's computer here is going to know about it before morning.

In fact, when anybody buys anything from any one of the 800 company-owned outlets, that information will be relayed from minicomputers in each of the stores to the main computer during the night.

KFC is equipping all its company-owned stores with Addressograph-Multigraph Corp. Documentor point-of-sale (POS) systems that combine the cash drawer function with a computer-controlled management information system. "The system will provide us with the information to do a better job of managing our business," according to Edward Chambers, KFC vice-president of finance. "It will provide us with immediate information that isn't available from conventional systems for days or even weeks.

"Effectiveness of advertising or promotions, for instance, can be monitored on a daily or weekly basis. If a campaign is working well, management will know to extend it. If one isn't working, changes can be made quickly," Chambers noted.

While the system won't provide KFC with any information it doesn't already have, "it gives us the data on a more timely basis," he said. "In the fast-moving retail food service business, the ability to be able to react immediately to consumer shifts in preferences is critical."

Aid, Not Authority

The Documentor system can collect data for a variety of management, marketing and accounting reports. For example, it will keep a running store-level inventory of chicken and other raw materials.

Store managers will find their paperwork eased by the POS system, which automatically generates all the daily operating control reports they now have to do manually. This includes a record of exactly what was sold each hour, including the exact number of soft drinks, pieces of chicken and containers of potatoes or salads and which sizes.

"The terminal system also performs employee timekeeping, enabling the manager

(Continued on Page 32)

Prentice Modem Needs No DAA

PALO ALTO, Calif. — Prentice Corp. has introduced a two-wire, half-and full-duplex Bell-compatible modem for automatic answer applications.

The modem, called the P-113D, is a direct-connect unit; it interfaces to the two-wire dial up network through a 97A or 97B jack. A Data Access Arrangement (DAA) is not required, a spokesman noted.

Users can connect the P-113D to the switched network in any of the three standard modes: programmable, fixed loss or permissive, he added.

Specifications of the P-113 include a 0- to 300 bit/sec serial binary asynchronous data format.

Unlike most competitive units — which have either limited diagnostics or which require a separate switch-selectable diagnostic module — the P-113D features full built-in "at-a-glance" diagnostics, the spokesman said. The front panel has nine LED indicators that automatically and continuously report operating status.

The card version of the P-113D costs $250. A stand-alone version (card and power supply) costs $370. Prentice Corp. is at 795 San Antonio Road, Palo Alto, Calif. 94303.

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Syfa Programming Speeded

IRVINE, Calif. — A screen management system that interactively generates terminal screen layouts for application programs has been announced by Computer Automation's Commercial Systems Division for its Syfa network processing system.

Called Panel Manager, the software relieves the programmer from coding time-consuming screen-handling routines, according to a spokesman. As part of an ongoing effort to simplify application programming on the Syfa system, the Panel Manager reportedly allows the programmer to define terminal screen panels used to receive operator input or to display application program output.

By using the Panel Manager, the development of screen-handling routines is "virtually eliminated" and the programmer is freed for other aspects of the program, the spokesman said.

Standard or Custom

Syfa users can utilize Panel Manager in the standard format offered by CA, or the Panel Manager can be tailored to individual user requirements. The package may be executed concurrently on any or all of the 24 terminals that can be attached to a Syfa.

The Panel Manager is available free to Syfa users CA said from 18651 Von Karman, Irvine, Calif. 92713.

POS Network Keeps Colonel's Chickens Counted

(Continued from Page 31)

and his supervisor to measure labor effectiveness," Chambers said, adding "this has become far more important since the minimum wage was increased. We are now able to schedule more effectively, keeping labor costs down."

When the system is fully operational, it will help the manager decide how much chicken to order daily and how much to cook each hour. It will also help him schedule his employees and order everything from soft drinks to shortening. But Chambers emphasized, it will only help.

"No machine can substitute for the manager's knowing that a nearby shopping center is running a sale or that the weatherman is forecasting two feet of snow," he commented.

To customers and employees, the system will look like an ordinary electronic cash register. Each key has a menu item instead of a number so that the cutomer service worker punches a button that reads "2-piece dinner," for instance, not the price, which is already programmed into the machine. It automatically rings up the right price and computes the sales tax automatically.

When the sale is completed, information about each transaction automatically goes into the memory in the register. During the night, the minicomputer will transmit data to the central computer in Louisville via a built-in teleprocessing link.

"What happens," Chambers explained, "is that the central computer calls each of the stores and 'interrogates' the minicomputer. It responds by transmitting all of the data it collected throughout the day. That will take about a minute." The hard-copy daily record is also retained on a standard register tape.

Because the computers communicate directly with each other, the opportunity for errors creeping in through manual keypunching is eliminated.

It's also a lot faster, Chambers pointed out. It takes less than four hours for the central KFC computer to gather the day's information from all 800 company-owned stores. By morning, selected management reports will be available when corporate executives arrive at their desks.

The first 110 systems have already been installed, the KFC executive said, and all stores will have them within a year. Customer service workers are being trained in the operation of the units.

"KFC data processing personnel worked with Addressograph-Multigraph's programmers to tailor a system that would fit our system exactly," Chambers said, "and that includes being flexible enough to accommodate a number of changes."

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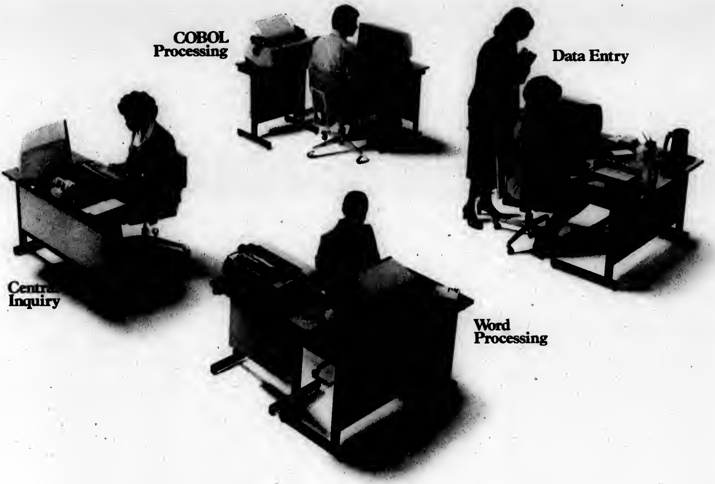

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Canadian Service to Access Telenet, Tymnet

OTTAWA — Rates have been filed for the connection of Canada's Datapac network with two packet networks in the U.S.

Datapac/Telenet and Datapac/Tymnet are the first international packet-switched services to be offered in Canada by The Computer Communications Group of the TransCanada Telephone System.

Interconnection with Tymnet, Inc. and Telenet Communications Corp. will allow subscribers in more than 100 cities in the U.S. to access host computers and terminals in 5 Canadian Datapac Serving Exchanges (DSE).

Rates for these two Datapac international services are based primarily on the volume of data transmitted, with distance a secondary factor. The following factors determine the total charges for a call:

- Number of kilopacs transmitted (a kilopac is 1,000 packets, each containing up to 128 characters).
- Holding time in minutes for low-speed asynchronous terminal connections for terminals accessing Datapac in Canada. One rate applies to connections in any of the 55 DSEs. Connect charges for Telenet or Tymnet vary, depending on the U.S. city in which the call originated.
- The Canadian city (DSE) involved with the call. The existing 55 DSEs have been assigned to bands for rating purposes for Canada-U.S. calls. Usage charges (per kilopac) are the same for all cities in a particular band regardless of which U.S. city is involved with the call.

To illustrate the application of the above charges, a computer located in any Canadian "Band 1" city and subscribing to Datapac 3000 access service may communicate with:

- Terminals operating at 300 bit/sec in 81 U.S. cities with access to Telenet public dial facilities for $1.10 per kilopac plus a holding time charge ranging from $1.80 to $4.20 an hour.
- Terminals operating at 300 bit/sec in 113 U.S. cities with access to Tymnet public dial facilities for $2.50 per kilopac plus a holding time charge ranging from $1.20 to $5.40 an hour.

Details of the Canadian service are available from the Computer Communications Group, 160 Elgin St., Ottawa, Canada.

On-Line Catalog for Libraries Uses Touch-Sensitive CRT Screen

NEWTONVILLE, Mass. — The Libs 100 Public Access Catalog — which can replace a library's card, book or microform catalog — has been introduced by CLSI.

The system communicates with the patron via the Libs 100 Browsing Terminal, which has a CRT with a touch-sensitive screen.

The display screen of the Terminal is divided into 32 distinct areas by a grid of horizontal and vertical lines. Twenty-two of the areas are used to display the library-specified contents of the on-line bibliographic and holdings files which are selectd by the patron.

The remaining 10 areas are used as control areas where the patron can request special instructions such as "next page," "previous page," "more details" and "start over," CLSI said.

By touching the screen of the terminal, patrons can see the bibliographic description of any title and the location and circulation status of any copy in the library's collection.

The system, which is scheduled to be available in August, will be integrated into CLSI's existing Normal Circulation Control System, which runs on a PDP-11/04. Prices for the complete system start at $75,000, depending on the library's size, number of branches and functions.

CLSI is located at 81 Norwood Ave., Newtonville, Mass. 02160.

Seminar to Cover Packet Switching And Alternatives

CAMBRIDGE, Mass. — The Yankee Group is sponsoring a two-day seminar entitled "Implementing Transparent and Intelligent Networks: Packet Switching and Its Alternatives," to be held March 22-23 in New York City.

The featured speakers will include Dr. Howard Frank of Network Analysis Corp., who will discuss how to test the viability of building an internal intelligent network and the step-by-step implementation procedures for such a network.

Moody and Doll

J. Roger Moody, Teletype Corp., will discuss Teletype's and AT&T's insights into the future needs of specific industry groups, and Dr. Dixon Doll, the DMW Group, will compare packet switching with other methods of getting intelligence into the network.

The seminar fee of $550 ($450 for additional attendees from the same company) covers attendance at all sessions, a copy of the *Yankee Group Research Manual* and two lunches, the group said. The firm can be reached through P.O. Box 43, Cambridge, Mass. 02138.

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WU Smarts Controller Now Concurrently Accesses Telephone, TWX Networks

MAHWAH, N.J. — The communications capability of Western Union (WU) Data Services' Smarts controller has been expanded to offer terminal users concurrent access to the public telephone and TWX networks via Bell 202, 103 and TWX protocols.

A multiple microprocessor-based controller with floppy disk storage, the Smarts controller has a microprocessor dedicated exclusively to communications, a WU spokesman said, making it possible for the company to program in additional communications protocols to its existing 202 operation — 103 and TWX being the first in a series to be announced. These protocols are availabe in a variety of combinations.

The stand-alone Smarts controller provides general-purpose communications terminals with communications control, text-editing and file management capabilities. It can be employed with any terminal in the company's product line, the spokesman noted.

The controller provides users with four levels of concurrency. Terminal operators can enter messages into the controller via the terminal console while it prints out a lengthy report on an associated printer; at the same time, the controller can be polled by a CPU while transmitting messages to the TWX network — all four activities taking place concurrently.

The controller employs two communications ports, either of which may be assigned to operate with a 202 or 103 modem or TWX or both 103 and TWX on an alternate basis, the company said.

Access to the TWX network enables users to reach Mailgram and Telegram services, international communications networks and the WU Telegraph Co.'s Infomaster switching center for a variety of computerized services.

Operators can enter messages into the Smarts controller either free-form or with prompts. Header message formats and even standard paragraphs can be stored on the floppy disk and called up when required to facilitate message handling and composition.

To correct errors in a message, the controller permits operators to search within a message's contents. Then they can text edit — adding, deleting or changing information while making revisions, acccording to the spokesman.

Floppy Storage

All messages can be stored on the floppy disk, which has a capacity of over 270,000 characters in up to 60 operator-named message files. Operators can access at random any message by file name through the controller's file directory.

For example, the spokesman said, all messages created during the day that are directed to a single location can be set up in a file segregated from all other messages and later linked for transmission, requiring only a single phone call. Alternately, all sales orders can be segregated from a day's traffic and printed out or transmitted to the computer.

Stored messages reportedly can be accessed in a variety of ways — by subject, date, location or other reference. This capability provides users with an electronic filing system, eliminating the need for duplicate filing or multiple listings, WU said. This feature also permits an audit trail of related messages.

In addition to operating in the batch mode, terminals with the Smarts controller can interact with the computer to retrieve computer-based data for insertion in messages.

The controller provides operators with the status of its send and receive files. In this way, the spokesman noted, the operator knows what has been transmitted, what remains for transmission and which ports are in use or free.

The Smarts controller equips terminals for automatic answering, so that either regular dial-up or TWX transmisssions can be received when the terminal is unattended. A single answerback is used for both dial-up and TWX use.

A speed restraint feature enables the terminal to communicate with slower international networks, WU said.

The enhanced system is available in a variety of configurations which include 10-, 30-, and 120 char./sec teleprinters, with or without the company's CRT terminal.

A typical configuration consisting of an EDT 33 teleprinter and a Smarts controller programmed for 1,200 bit/sec communications on one port and TWX services on the other port leases for $240/mo on a three-year basis including maintenance.

Deliveries will begin in the second quarter, WU Data Services noted from 70 McKee Drive, Mahwah, N.J. 07430.

Intertec Board Enhances LA36

GAITHERBURG, Md. — Intertec Data Systems has announced the Superdec Throughput Optimizer, a printed circuit board designed to replace the existing digital electronics in Digital Equipment Corp.'s LA36 Decwriter II teleprinter.

The Superdec upgrades the Decwriter II for 1,200 bit/sec operation, and furnishes automatic and manual top-of-form, full horizontal and vertical tabs (addressable and absolute), adjustable right and left margins and an RS-32C interface, according to a spokesman.

Features not previously offered to Decwriter users include a double-wide character set, bidirectional printing and 32 user programmable characters, he added.

An APL character set, selective addressing and an answer-back feature are options that can be installed by plugging additional IC chips into the board, the firm said. Installation of the plug-compatible Superdec can reportedly be completed in a few minutes.

Price of the unit is $395 through Intertec's Eastern Regional Marketing Office, 19530 Club House Road, Gaithersburg, Md. 20760.

Very High Switching Speeds

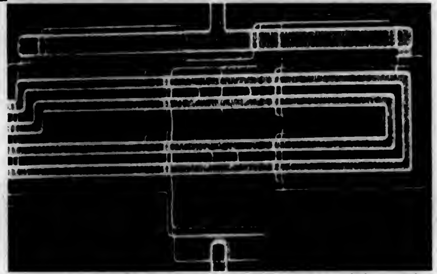
Josephson Superconductor Has Promise

SAN FRANCISCO — Whenever computer scientists gather and the discussion turns to the possible technologies of the future, IBM's Josephson junctions are bound to come up.

Josephson junction devices — superconductors still in the experimental stage — operate on principles entirely different from those of the silicon transistor circuits used in all of today's computers. Experimental logic circuits made of Josephson junctions switch in 50 to 100 picosec (trillionths of a second) and the memory cells have an access time of 7 nsec (billionths of a second), according to IBM. This permits them to be packed very closely together, an essential quality because with such high switching speeds the time an electrical impulse takes to move from one circuit to the next becomes the major limitation on a computer's speed. In 100 picosec, for example, an electrical signal moves about half an inch.

These most recent results of a long-range exploration of Josephson technology by IBM's Research Division were reported at the recent International Solid-State Circuits

(Continued on Page 42).



Shown above is a scanning electron photograph of a Josephson OR gate, which contains four Josephson junctions. The junctions are the small circular regions near the center of the picture; the horizontal lines are control lines that switch the junctions. This circuit switches in less than 50 picoseconds.

HIS Remodels Level 64 Into One Unit

WALTHAM, Mass.— Honeywell Information Systems, Inc. has remodeled its Level 64 line of medium-scale systems, replacing the five previous models with a single multiconfiguration model it said spans its "entire range of medium-scale systems and exceeds the configurability range of the former Level 64 models."

HIS also introduced systems and application software feaures and peripheral devices, enhanced communications capabilities and announced an expanded field marketing and service organization to support the Level 64.

With the single-model Level 64 system, a user can enter at any point and, as his requirements change, reconfigure a system in any of four dimensions — CPU performance, memory capacity, peripherals mix or communications processing, a spokesman claimed.

A remote maintenance system, for use with new or currently installed Level 64 systems, RMS/64, allows engineers to diagnose problems from remote support centers.

A new contract approach offers Level 64 hardware on one-, five-, six- or seven-year leases on a multiterm contract. Selected peripherals have an additional three-year term as an option.

A 300 card/min reader, 70M-byte disk and both 600-and 800 line/min line printers were introduced for the Level 64.

'An Advanced Concept'

By Frank Vaughan
CW Staff

WALTHAM, Mass.— Honeywell Information Systems, Inc. claimed its remodeled Level 64 medium-scale system represents "an advanced concept: a system designed to meet present information processing needs while accommodating future expansion through on-site upgrades to increase memory size, peripheral capacity and processor performance."

The entry-level system is "roughly equivalent" to an IBM 370/115; a fully configured system is "roughly equivalent" to an IBM 370/138, a spokesman suggested.

In trying to meet these claims, HIS offered five levels of instruction speed, with internal clock cycle times ranging from 500 nsec at the entry level down to 370 nsec with the most powerful processor configuration.

System memory options range from a minimum 64K bytes up to 768K bytes,

(Continued on Page 40)

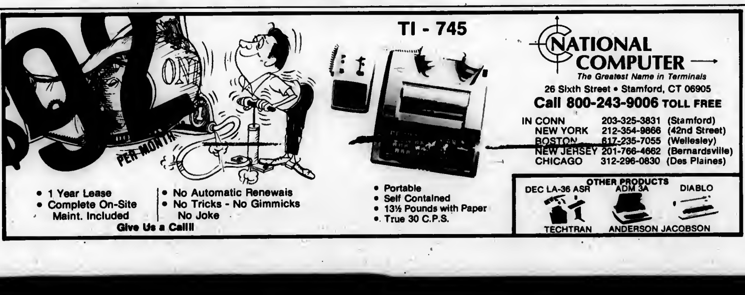
CMC XL40 Gains Enhancements

LOS ANGELES — Pertec Computer Corp.'s CMC Division has expanded the multitasking power of its XL40 distributed processing system with a series of hardware and software enhancements.

The enhancements, which a spokesman said will "broaden user capabilities in the areas of interactive communications and transaction processing," include IBM 3270 emulation mode, station printers, remote subsystem, a 2,000-character CRT, increased disk capacity and expanded random-access memory (RAM).

The 3270 mode compatibility extends the XL40's existing Cobol Shared Access Method (Cosam) information retrieval package. With 3270 mode, requests for information not resident in the XL40's local data base can be automatically passed to the host CPU in a mode completely transparent to the operator, a spokeswoman said.

(Continued on Page 44)



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MIC to Explore Data Entry

CHERRY HILL, N.J. – Management Information Corp. (MIC) is sponsoring a three-day seminar at the Cherry Hill Inn here that deals with the practical world of data entry."

Discussions with instructors and other participants will provide users with problem-solving techniques that can be implemented immediately, MIC claimed.

The course includes instruction in data entry system concepts, organization of the data entry department, data entry control techniques and getting the most out of keyboard equipment.

It will also cover personnel communications, personnel motivation, establishing keying standards, operator ratings, improving data entry productivity and operator training.

MIC will hold the course on May 22-24, Sept. 11-13 and Nov. 13-15.

Registration fees are $395 for subscribers of MIC publications and $425 for nonsubscribers. The price includes all luncheons, meeting materials and a get-together cocktail hour. For more information, contact MIC at 140 Barclay Center, Cherry Hill, N.J. 08034.

Binder Holds Cards

NEW YORK – A self-standing, easel-backed binder designed to store magnetic cards was unveiled by Printcraft Systems, Inc.

The unit includes a vinyl-covered three-ring binder, five storage panels, title cards and index strips, a spokesman said. Each storage panel has a capacity for up to 34 cards.

The unit sells for $27.50 from the firm at 11-17 Beach St., New York, N.Y. 10013.

'Advanced Concept' Touted

(Continued from Page 39)

and expansion comes in both 64K-byte and 128K-byte increments.

Memory read time ranges from 1 microsec down to 740 nsec for 4 bytes of main storage; write time ranges from 1 microsec to 940 nsec, also for 4 bytes of main storage. Memory access time is 175- to 145 nsec, the spokesman claimed.

Two independent I/O channels are standard; an option offers up to 10 channels. Each channel has a 1.25G byte transfer rate with a 4.0 to 4.25 aggregate I/O transfer rate.

Up to three data communications controllers can be installed with up to 14 lines per controller. Synchronous, asynchronous and/or binary synchronous lines are supported with speeds from 100 bit/sec through 19.2 bit/sec.

A 64K entry-level system with a 600 line/min printer, 300 card/min reader (with PM200/0 instruction set) and two 70M-byte disks sells for $221,780 or leases for $4,891/mo on a five-year lease. Maintenance costs $826/mo.

A "typical" 512K full-range system with a 1,200 line/min printer, 1,050 card/min reader, six 100M-byte disks and six 200K-byte tape drives costs $872,959 or leases for $18,521/mo on a five-year plan. Maintenance costs $2,786/mo.

The newly introduced 300 card/min reader is a counter-top device that can be equipped to sense marks encoded in either HIS or IBM format and can be upgraded on-site to read at 500 card/-min. The reader sells for $9,060 and leases for $225/mo.

With the introduction of the 70M-byte disk, HIS said it "functionally eliminated" the 29M-byte unit previously available with the Level 64. The disk can be upgraded on-site to the 100M-byte capacity; it costs $13,500 and leases for $370/mo. HIS also added two medium-speed line printers for the Level 64, both featuring interchangeable belt cartridges with 120 print positions upgradable to 136 print positions. A variety of 48-, 64-, and 96-character belt cartridges are available, according to the spokesman.

The 600 line/min printer sells for $32,060 and leases for $812/mo while the 800 line/min unit sells for $37,720 and leases for $951/mo.

HIS' Remote Maintenance System/64 (RMS/64) reportedly allows field engineers to monitor, control and diagnose Level 64 installations as well as take some corrective action.

User benefits with RMS/64, HIS claimed, include immediate access to a systems support specialist; remote access to error logs for threshold analysis; remote hardware tests and diagnostics initiated in conjunction with user operations; improved maintenance diagnostics for remote sites; and immediate backup availability for an on-site engineer with a particularly difficult problem.

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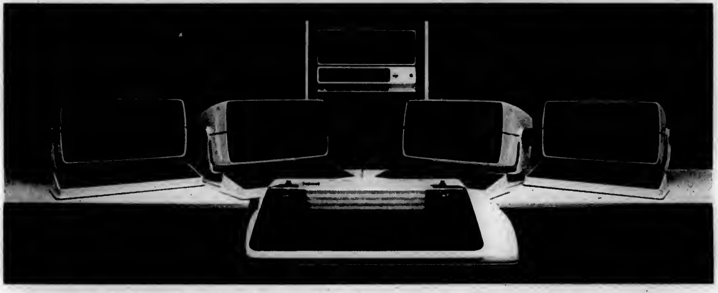

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Josephson Units Hold Promise for Faster CPUs

(Continued from Page 39)

Conference here. The work was done at IBM laboratories in Yorktown, N.Y., and Zurich, Switzerland.

Although Josephson circuits require refrigeration to temperatures near absolute zero (-459°F, or -273°C), they are attractive for fast computers because of their very fast switching speed — about 10 picosec for individual devices — and their very small power requirements. The product of power and delay time is a generally used figure-of-merit for switching circuits.

The Josephson circuits have a power delay product of about 100 attojoules (100 by 10^{-18} joules), a thousand times or more better than than of transistor circuits, IBM said.

The logic circuits fabricated at the Yorktown laboratory include AND, OR, INVERT and LATCH functions. The circuits are built with what are called Josephson interferometers, each consisting of three Josephson junctions coupled to each other via a common conductor and an inductance. This configuration permits a reduction in capacitance as compared with a single, larger junction and thus increased switching speed.

Measured delays per stage, which correspond closely to calculated values, are 40 picosec for the OR circuits, which consist of one interferometer with two control lines, and and average of 70 picosec for the AND gate.

The AND gate consists of two interferometers, and its speed of operation depends on the sequence of its input signals. In one case, it operates in 40 picosec; in the other, it takes slightly less than 100 picosec.

These figures are for a fan-out of one. Additional fan-outs introduce a delay of 14 picosec each. Because the circuits are superconducting, the fan-out ratio is unlimited for all practical purposes, IBM said.

The smallest lines used in the circuits are 2.5 microns wide. The actual Josephson junctions are circular, with a diameter of 5 microns.

The Josephson electrodes are fabricated of an alloy of lead, indium and gold, with an insulating layer of oxide 30 to 50 angstroms thick providing the Josephson tunneling region.

Josephson Memory

The experimental memory model described by researchers from the Zurich laboratory is the most complex Josephson chip yet fabricated, containing nearly 4,500 Josephson junctions. The array was built to test feasibility of the elements of a 16,000-bit Josephson main memory chip.

The memory cells in the chip are called "single flux-quantum" cells, since a bit of information is represented by a single quantum of magnetic flux — the ultimate economy in magnetic memory. Each cell consists of two Josephson junctions connected by an inductance, an interferometer similar in principle to the three-junction interferometers used for logic circuits.

A persistent current can flow in this structure, with a magnitude set by the quantization of magnetic flux.

Because the memory cells are superconducting, storage is nonvolatile and no power is required in the quiescent state. Projected power dissipation for a fully populated 16K chip at maximum repetition rate is only 40 microwatts, IBM said.

Illustrating the extremely low power dissipation of Josephson circuits, a 2M-byte memory would dissipate a maximum of 40 milliwatts, the firm noted.

The minimum line width in the memory chip is 2.5 microns, and the memory cell size is 1,500 square microns, giving a density of about 400,000 bit/sq in. A double of storage density seems possible with the same line width, according to the Zurich researchers.

Since the single flux-quantum memory is envisioned as the main memory for a Josephson computer in which a high-speed cache memory would also be provided, its performance has been optimized for low power dissipation rather than maximum speed. Nevertheless, the measured access time is only 7 nsec.

A conservative projection is that the full 16K bit chip should have an access time of 15 nsec and a read/write cycle time of 30 nsec, IBM claimed.

An important issue in exploration of a new technology is the reproducibility of device characteristics from run to run. The Zurich group found the spread in maximum Josephson current among several chips was about 10%, a figure close to what would be required to build a full-sized memory.

History of Devices

Josephson devices exploit an effect in superconductors originally predicted by the British physicist Brian Josephson and soon confirmed experimentally. The prediction was that a supercurrent could flow through an extremely thin insulating barrier between superconductors.

The insulator, if it is thin enough, acts as a weak superconductor itself, as there no voltage drop across it.

A second effect, explored earlier by Ivar Giaever of General Electric, is normal electron tunneling through an insulator separating superconductors. In this case, there is a voltage drop across the insulator corresponding to the energy gap between superconducting and normal electrons, analagous to the energy gap in semiconductors.

Josephson tunneling is quite sensitive to current density and the presence of a magnetic field. When either exceeds a critical value, the insulating layer reverts to the normal, voltage drop state.

Soon after Josephson's theory was confirmed, an IBM scientist, Juri Matisoo, recognized the two kinds of tunneling provide the basis for a switch. A small current in a control line can generate a magnetic field which switches the device from the zero voltage Josephson state to the few millivolt voltage drop of the normal tunneling state explored by Giaever. Matisoo succeeded in building and testing such switches in 1965.

An experimental Josephson memory chip is lowered into a bath of liquid helium for testing. The devices operate only at the low temperature provided by liquid helium, which boils at 4.2°C above absolute zero.

From the outset, Josephson tunneling devices appeared highly attractive for two reasons. First, the transition is a quantum-mechanical one and thus is inherently very fast.

Recent experiments at the Zurich laboratory have borne this out, showing that individual devices switch in probably less than 10 picosec.

Second, voltage and current levels are in the millivolt and milliampere range, leading to power dissipation in the microwatt range. The power-delay product of logic circuits built at the IBM Yorktown laboratory is less than 100 attojoules (100 by 10^{-18} joules) — 1,000 or more times smaller than that of silicon circuits.

Initial progress with Josephson junctions was slow because they require insulating layers only about 50 angstroms thick. Such layers could not be grown reliably until fairly recently.

In addition, Josephson switches consist of several layers of metal and oxide films which must withstand the stress of temperature cycling between near-absolute zero and room temperature.

The most challenging engineering problem in exploiting the high performance of Josephson devices, according to IBM, is packaging. Because of their low power dissipation, Josephson devices can be packed as closely as can be managed technologically.

In principle, this permits them to overcome the signal propagation delays that ultimately limit the performance of high-speed transistor circuits which require relatively large heat-removal structures.

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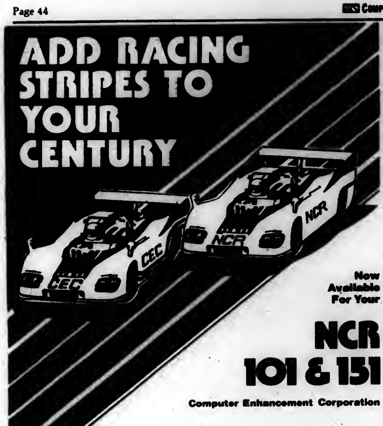

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CMC Boosts XL40 System

(Continued from Page 39)

As a result, operators may interrogate either local XL40 disk files or a central data base at a remote location with little delay and no change of operator procedure, she added.

Station printers nominally rated at 60- to 120 char./sec may now be combined with XL40 terminals. The printers are logically associated with specific terminals through dynamic assignment and are designed to be located separately from terminals if required by the application, CMC said.

In addition to providing CRT terminal hard copy, these printers will also provide hard copy for keyed data under program control, which is combined with prviously stored disk file information.

Remote Subsystem

The remote subsystem capability allows all XL40 terminals and station printers to be connected to dial-up or leased telephone lines. Remote operation is essentially the same as if the station were directly connected, according to the spokeswoman.

Users can locally cluster XL40 terminals and printers at sites requiring characters for application information. or locate them separately as satellite terminals where transactions "may be limited in volume but essential to timely business operations," she added.

The 2,000-character CRTs augment the XL40's flexibility in multitasking applications, CMC said. With more than four times the display of the XL40's standard 480-character CRT, the latest terminal reserves its two top display lines of 80 characters each for status data and operator guidance, retaining below a full page of 1,840 characters for application information.

Mixed Terminals

The 2,000-character CRT can be intermixed with 480-character terminals.

Disk memory expansion doubles disk capacity from a total of 35M-bytes to 70M bytes of formatted data. Up to four disk drives of 17.6M bytes each can be attached to an XL40 to store large-scale indexed files as well as user's data, application programs and the XL40's multitask operating system.

RAM expansion quadruples the XL40's addressabvle memory from 128K bytes to 512K bytes.

Initial installations of the enhancements will be made in fourth quarter. A basic XL40 with 64K bytes of memory, five 480-character CRTs and 4.4M bytes of disk leases for $975/mo and sells for $32,200.

A configuration consisting of 256K bytes of memory, 35.2M bytes of disk, eight 480-character CRTs, a 300 line/-min printer, 360/20 Hasp communications, 3270 mode and a remote subsystem which also includes two 2,000-character CRTs and two station printers leases for $3,315/mo and can be purchased for $113,050.

XL40 lease rates are based on a three-year lease and include maintenance and the complete software package from the firm at 12910 Culver Blvd., Los Angeles, Calif. 90066.

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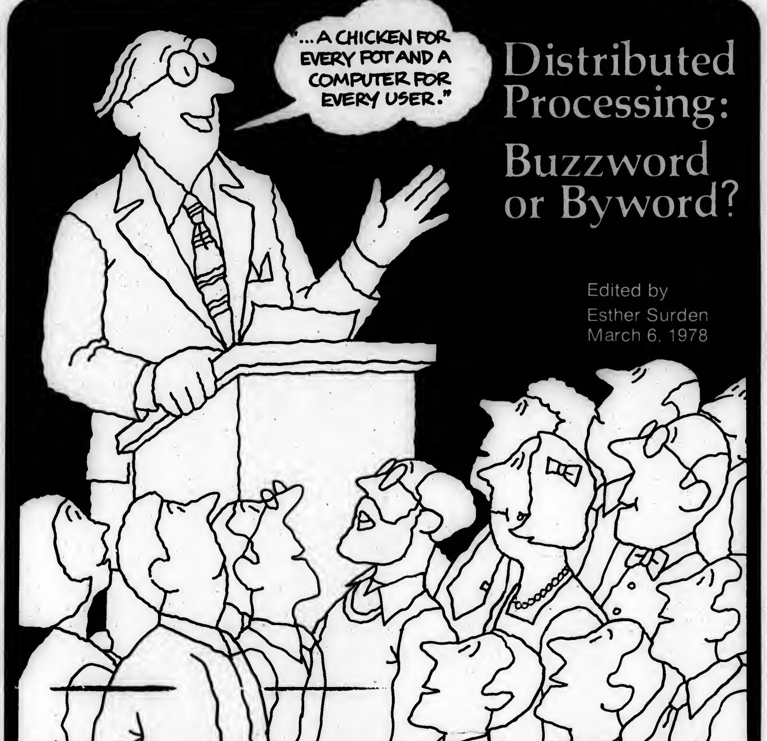
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Distributed Processing: Buzzword or Byword?

Edited by
Esther Surden
March 6, 1978

Flexibility, Ease of Use Top List

IBM User Group Details 'Ideal' DDP System

High on most users' lists of priorities for an ideal distributed data processing (DDP) system are flexibility and ease of use, according to a paper by the Distributed Computing Task Force of Share, Inc., the IBM large systems users group.

Simplicity is "critical," the report noted, because "hardware costs per unit of work have been falling while the costs for people have been rising." As this trend continues, "it becomes increasingly important to reduce the human effort required to solve the problems."

In addition, people who are not DP professionals tend to use distributed systems, so "all possible complexities that might be added by distribution should be taken over by the system, thus making the distributed nature of the system transparent to its users."

Flexibility is important because the systems must run a number of applications with differing requirements. "A wide range of upward- and downward-compatible hardware and software configurations must be provided," according to the report.

"In a distributed environment, systems operations and maintenance must allow for the casual, nonsophisticated user," the task force pointed out. To support the need of nonsophisticated users to operate the system, diagnose certain failures and make certain repairs, systems should have the capacity to run a job in such a way that "portions can be run concurrently in different nodes," Share's report stated.

Share, Inc., the IBM large systems users group, issued a white paper in August 1977 on "Requirements for Distributed Computing Systems, 1980 and Beyond." Prepared by the Distributed Computing Task Force, the paper presented IBM with an "unadorned list of requirements" for a distributed data processing solution that would be in the users' best interests.

While jobs should run in different nodes, job segmentation, distribution and run assignments should take place without requiring user knowledge. "The enterprise must have optional override facilities on a job-by-job basis," the report said.

With systems that maintain a uniform but acceptable degree of responsiveness across a broad range of workloads, a single interchange medium should be uniformly supported across all nodes, including a uniform file structure and access method.

Redundancy Requisite

Each component of a DDP system should permit redundancy. The user, at his option, must be able to select the level of redundancy. "Where possible, the failure of any component within a node [must] *not* take the node out of service," the report said. Nor should failure of any one or more nodes cause the system to become inoperative. Each surviving node must continue to be fully operational and able to interact with all other surviving nodes.

"When a failure occurs, the operating nodes must recognize a failure occurred and take appropriate actions. Records and logs of failures must be automatically kept and made available on request," the task force added.

Easy Upkeep Essential

For end users, "hardware and software maintenance should be made as simple as possible," with "isolation of the failing card, component or software module easily accomplished by the user.

"Removal and replacement of the failing component or module should be such that the user can do it in a nondisruptive manner," and "actual repair of cards or components should be performed by maintenance personnel, off the system, after replacement has been made."

The vendor should supply "uniform and simple-to-use tools ... to aid in configuration planning, performance analysis and diagnosis and problem diagnosis" so that any node can use these tools to analyze any or all node(s), as authorized.

"Diagnostics must specify the failing software unit or hardware component at the lowest replaceable level or module," the task force noted, and "it must be possible to construct a diagnostic test environment that is isolated from other test and production environment."

Another "must," according to the task force, is that the hardware accept and properly handle variations in the

(Continued on Page S/40)

As Important as Throughput

Security: Plan It Now or Pay for It Later

By John J. Hunter
Special to CW

With the growing interest in distributed data processing (DDP), system designers and evaluators would be wise to look beyond throughput and capacity as the primary measures of a "good network." If you don't place security on the same footing, you'll pay dearly later on.

What is a secure system? It's a collection of hardware and software which ensures that once a message is entered, it will be delivered without unauthorized alteration, detection or delay.

To attain such security, the system must be reliable; capable of securely storing data which cannot be immediately delivered; able to detect and foil unauthorized access; and capable of continued — albeit limited — operation while recovering from hardware/software failures.

A good number of people think of a secure system as one that protects data from unauthorized eyes. While this is certainly an important factor, it isn't the only one — or for that matter the most important. What is important is whether the message is delivered.

It is folly to assume that once a message enters the network, it will, barring a major component failure, reach its destination. But it doesn't take a major component failure — or a minor one for that matter — to lose a message.

It can easily happen if the receiving terminal is unavailable at the time of transmission or if the message's priority calls for deferred delivery.

If the system is designed so messages are transmitted from a single site, keeping track of them is as simple as assigning an incremental reference number or code to each message. Messages received out of sequence are easily identified, as are missing or duplicate messages.

The problem gets a bit tougher when there are multiple sending sites. Employing only reference numbers won't work, since it's almost impossible to guard against duplicate numbers.

A way around this is to assign an identifier code to each terminal and prefix this code along with an incremental numerical identifier to each message.

Undelivered Messages

The highest incidence of lost messages occurs when delivery is deferred and the message is routed to a hold file. A number of steps can be employed to ensure that all messages reach their final destination.

For example, the receiving station could be required to issue a confirmation message when the message is received. If messages are held in files for long periods, an aging procedure could be instituted to periodically flush them. In both cases, the identification code is used to check for missing or duplicate messages.

If the system is prone to errors or failures, copies of the messages should be stored on a secure device that can be queried during the recovery pro-

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User Mixes Doubles: Centralization, Dispersal

By Joe Mitchell
Special to CW

CHICOPEE, Mass. — Spalding, a division of the Questor Corp., is a major sporting goods company with manufacturing, sales and distribution facilities worldwide. A detailed analysis made of Spalding's entire corporate information system inventory and computer processing capability last year resulted in a decision to overhaul the DP environment from the bottom up.

Information systems, computing equipment and system development/-programming techniques would all be upgraded following an aggressive, two-year plan that called for the use of packaged systems wherever feasible and the use of computer configurations that worked, in the broadcast sense, "out of the box."

In developing the detailed plan, one of the principle guidelines was to avoid pioneering, but to target an industry leadership position while keeping a close eye on price/performance. This concern for good price/performance ratios proved to be challenging.

In a noncompute-bound environment, cost considerations pointed to minicomputers but, in Spalding's case, not to dispersed minis — Spalding is accustomed to centralized, batch computing.

An on-line environment that processes critical programs calls for high processing power and provisions for backup; performance is of greater importance than price to Spalding. Peripheral equipment is costly and should be minimized, but multiple data bases are needed that call for large amounts of on-line disk space.

With these and other considerations in mind, a detailed request for proposal (RFP) was prepared to evaluate large-scale minicomputers supported by proven, comprehensive system software. The system selected would answer price/performance considerations via network software (for peripheral equipment sharing, on-site redundancy, etc.) and would support on-line operations concurrently with batch processing, support a data base management system (DBMS) and provide a number of other capabilities/-features.

In addition, it would be desirable if a selection of materials planning and financial information packages were available and operational on similar, installed equipment at customer sites.

Line Items Weighted

The vendors answering in the RFP included Data General Corp., Digital Equipment Corp., Hewlett-Packard Co. and Honeywell Information Systems, Inc. A weighted point system was employed in evaluating each line item. The categories were system facilities, weighted at 40%; hardware features/capabilities, 40%; and other, 20%.

The rating scheme categorized all items to be evaluated as "required" or "desirable." Each item was scored as "yes" or no. One point was awarded for each yes, zero points for a no. The "required" total had a 75% weight, the "desirable" total had a 25% weight.

The ratings for overall quality were excellent, 91-100; good, 81-90; average, 71-80; poor, 61-70; and un-

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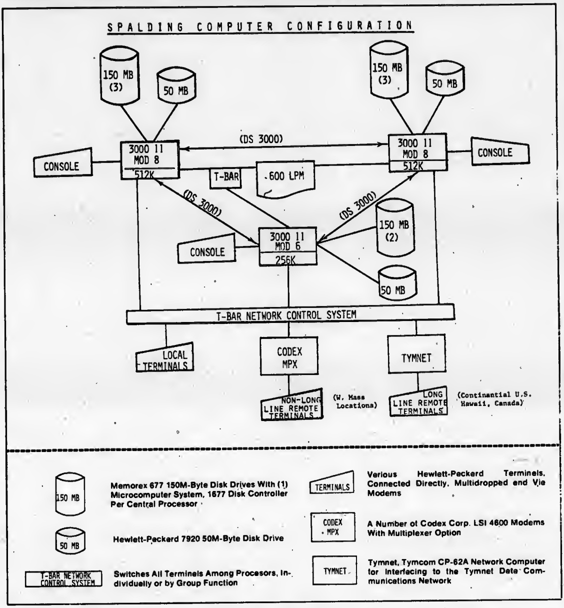
SPALDING COMPUTER CONFIGURATION
150 MB (3)
50 MB
150 MB (3)
50 MB
(DS 3000)
CONSOLE
3000 II MOD 8 512K
3000 II MOD 8 512K
CONSOLE
T-BAR
600 LPM
(DS 3000)
(DS 3000)
150 MB (2)
CONSOLE
3000 II MOD 6 256K
50 MB
T-BAR NETWORK CONTROL SYSTEM
LOCAL TERMINALS
CODEX MPX
TYMNET
NON-LONG LINE REMOTE TERMINALS
(W. Mass Locationa)
LONG LINE REMOTE TERMINALS
(Continantial U.S. Hawaii, Canada)
150 MB
Memorex 677 150M-Byte Disk Drives With (1) Microcomputer System, 1677 Disk Controller Per Central Processor
50 MB
Hewlett-Peckard 7920 50M-Byte Disk Drive
T-BAR NETWORK CONTROL SYSTEM
Switches All Terminels Among Procesors, Individuelly or by Group Function
TERMINALS
Verious Hewlett-Peckard Terminels, Connected Directly, Multidropped end Vie Modems
CODEX MPX
A Number ot Codex Corp. LSI 4600 Modems With Multiplexer Option
TYMNET
Tymnet, Tymcom CP-62A Network Computer tor Interfecing to the Tymnet Dete Communicetions Network

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KB-8
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Low cost, reliable, factory floor type data entry terminal… **around $900***
Available with badge readers, journal printers, customizable keyboards, and displays, etc.

TR/B
Special purpose multi display data entry terminal **around $2000***
Used with mini computerized-, **conveyor** systems, etc.

*Typical, small quantity, end user prices

With DDP, Automatic Picking

Chemical Firm Gets Real-Time Inventory Help

By Robert St. John
Special to CW

GREENSBORO, N.C. — The Dyestuffs and Chemicals Division of Ciba-Geigy Corp. here began the operation of a new order entry, order processing and inventory management system in June 1976.

While the previous system satisfied the division's order processing needs, it was deficient in the inventory information and file maintenance areas. In addition, it was a batch-oriented system designed for centralized processing on a large IBM 370 with orders and inventories handled manually at the local distribution center level.

The new system makes use of real-time technology and is both an order processing and inventory management application. The division has been able to completely centralize these functions at its Greensboro headquarters and effect a considerable reduction of personnel at the remote branches.

Key to the application is the concept of a distributed processing system combined with an automatic picking algorithm. Product, customer and inventory files are maintained on an IBM System/3. This permits inventories at the distribution centers to be centrally monitored on an individual drum basis. It also permits orders to be entered or altered on-line. The IBM 3 then transmits information as required to a central corporate system for billing, sales processing and corporate file maintenance.

Chemical products for the dyestuffs and chemicals division are manufactured at Ciba-Geigy plants in McIntosh, Ala., Cranston, R.I., and the Charles S. Tanner Co. in South Carolina. Some dyestuffs are manufactured at the Toms River Chemical Co. in New Jersey and some are imported from Ciba-Geigy Ltd. of Basle, Switzerland. Marketing is organized so that concentration is focused on the textile, detergent, cosmetic, paper and leather industries.

Customers place orders (usually by telephone) to the centralized order processing department in Greensboro, N.C. Goods are mainly shipped through two major distribution centers — in Charlotte, N.C. and in Toms River, N.J. However, especially in the case of chemicals, shipments can be made directly from one of the five manufacturing plants or from public warehouse locations throughout the

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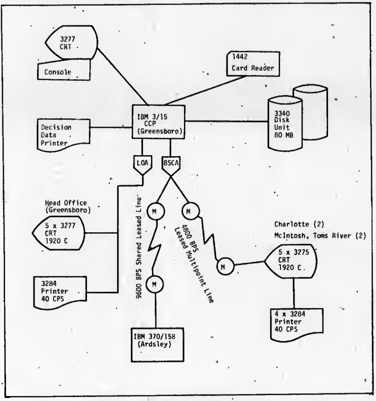

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That began to change when users discovered the price/performance advantages of our plug-to-plug, key-for-key alternative. Faster graphics order processing. More complex screen images. Flicker-free refresh rates. Remoting up to 3 miles. All at lower cost.

Now all of the systems installed worldwide are there because the users needed the advanced features that only Adage can supply. So there's no need to wait until late this year for delivery of IBM's 3250.

Quick delivery and choice of lease or purchase are still important pluses in dealing with Adage. But the major benefit is in having a vendor who can keep pace with your needs — with the best in 2250-type graphics or with the more powerful Adage GP400 Series systems designed to interface with any host minicomputer system.

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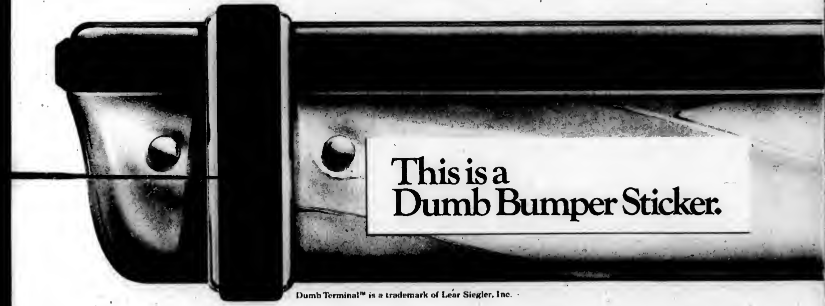


Dumb Terminal™ is a trademark of Lear Siegler, Inc.

Top Firms Adopting DDP in Variety of Guises

By John Gantz
And John Callahan
Special to CW

Is distributed data processing (DDP) a myth? Is the conventional wisdom out of whack and DDP just a passing fad? Or is there some fire behind all the smoke coming from vendors, pundits, consultants and seminar savants?

In service to its subscribers (and curious over its own reason for existence), International Data Corp.'s *Distributed Processing Newsletter* set about recently to find out. In a telephone survey of 40 of the Fortune Top 100 firms, DP and data communications managers were contacted regarding their network planning methods and the application of DDP within their companies.

The results? DDP is passing its entrance tests. Although definitions remain foggy — and may always be — almost 40% of those polled currently have some sort of DDP involving local data bases, primarily distributed data entry/local inquiry. Most of these applications went up within the last two years.

Furthermore, close to three-quarters of the respondents had plans for future DDP applications — including those with current DDP applications — and over two-thirds of those had specific applications in mind.

(The caveats: For one thing, 40 users don't comprise a statistically representative sample — although this particular group accounts for 38,360 remote terminals in use. For another, the degree of distribution of the applications varied from distributed data entry with intelligent terminals to distributed processing and local maintenance and updating of the data base. Still, if you're going to work with an *un*statistical sample, 40 of the Fortune Top 100 isn't a bad place to start.)

As of the fourth quarter of 1977, the respondents reported 38,360 terminals, ranging from 38 to 6,000 per respondent; and estimates of December 1978 terminal populations led to a compound annual growth rate just over 20%. By December 1980, the number of terminals will double.

But that's just terminal growth. What about DDP? First, we asked about the

(Continued on Page S/52)

CURRENT DISTRIBUTED APPLICATIONS

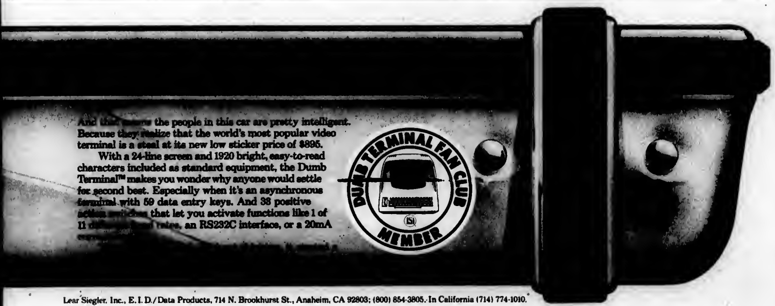
Type	Year Implemented	Equipment Used
Seismic Data Bases	1976	"Phoenix"
Bulk Terminal Application	1977	Datapoint Corp. 5500
Data Collection & Inquiry — Manufacturing	1973	IBM System/7
Billing	1965	IBM 360/30
Shipment Information	1975	Datapoint
Special — Bill of Materials/Inventory	1977	Digital Equipment Corp. PDP-11/34
Data Entry	1974	Four-Phase Systems, Inc.
Personnel	1976	Datapoint 2200
Order Entry and Payroll	1973	Datapoint 1100 (60)
Data Collection	——	—
Logistics Application	——	Philips Doc Writer
Data Entry, Editing, Validation	1976	Datapoint, Data General Corp.
Stores & Maintenance (Inventory Control)	1977	Texas Instruments, Inc. DXS (three)
Factory Floor Data Collection & Tool Inventory	1970	Datapoint DPI
Inventory, Customer File & Inquiry	1976	TI 990/10 (130)
Scheduling at Construction Sites	———	mini-based
Order Processing	———	Four-Phase, DG, Data 100
Regional Sales Office Inventory	1960s	IBM 1130

FUTURE DISTRIBUTED APPLICATIONS

Type	Year Implemented	Equipment Used
Sales Accounting	1977	—
Bulk Terminal Application*	1977	IBM 3790 (two installed/14 on order)
Well Production, Stats, & Control*	1978	—
Purchasing	1978	Mini vendor not selected
Warehouse Inventory	1978	Vendor not selected
Sales Order Entry	1978	Four-Phase Systems, Inc.
Credit Checking, Data Entry	1978	IBM 3790 (six).
Local Inventory and Customer Credit for Distributors	—	IBM 3790 (15-20)
Hospital System — Personnel Information, Claims Processing*		Four-Phase IV-70
Envelope Division	1978	IBM System 3 (replaces 3741)
Ordering & Billing	1978	Datapoint Corp.
Specification — Bill of Materials/Inventory	1978-9	Add DEC PDP-11/34s (10)
Machine Efficiency for Plants*	1978	DEC PDP-11/34s
General Accounting for Regions*	1979	DEC PDP-11/34s
Financial and Manufacturing	1977	IBM 3790s (30)
Credit Reporting System*	1978	Mini vendor not selected
Order Entry/Customer Inquiry	1977	Datapoint 5500
Billing and Purchase Orders	1977-8	IBM 3790 (four, two with 3760)
Order Billing*.	1978	Mini vendor not selected
Production Scheduling	1978	Mini vendor not selected
Teletype-28 Replacement*	—	Texas Instruments, Inc. 770s

* Company currently has a DDP application.

DDP plans reported by some Fortune Top 100 firms.


And that means the people in this car are pretty intelligent. Because they realize that the world's most popular video terminal is a steal at its new low sticker price of $895.

With a 24-line screen and 1920 bright, easy-to-read characters included as standard equipment, the Dumb Terminal™ makes you wonder why anyone would settle for second best. Especially when it's an asynchronous terminal with 59 data entry keys. And 33 positive action switches that let you activate functions like 1 of 11 different baud rates, an RS232C interface, or a 20mA [illegible]

Lear Siegler, Inc., E.I.D./Data Products, 714 N. Brookhurst St., Anaheim, CA 92803; (800) 854-3805. In California (714) 774-1010.

DDP Helping Raleigh Pedal Toward Inventory Control

Special to CW

BOSTON — Raleigh Industries of America, Inc. is racing toward better control of its business with the installation of five distributed minicomputers that are "bringing computing right where it's needed," according to John McEvoy, DP manager.

Raleigh distributes bicycles and cycling-related parts and accessories through five combined sales office-warehouse locations in Westwood, Mass.; Secaucus, N.J.; New Orleans, La.; Bensonville, Ill.; and Long Beach, Calif.

Each warehouse maintains an inventory of many different bicycle models and approximately 5,000 parts and accessory items, which are sold primarily through local dealers throughout the country.

"When money was freer, dealers would carry large inventories of bicycles and parts," according to John Baggott, president.

"Now, they're relying on the bicycle suppliers to carry the inventory for them. That left us with two options: increase our inventories to meet dealers' needs quickly or adopt more sophisticated inventory management techniques to keep our investment down and still meet dealer needs. We felt we could save in the long run by improving management techniques."

Keyed information is available at Raleigh's warehouse almost immediately.

An expanded DP system was at the core of the improvement. Raleigh's old system, an IBM 1130, was not only limited in capacity, but was also becoming obsolete. All data from the warehouses, such as sales orders, receiving reports, stock transfers and cash receipts, were mailed daily to the Boston office, where processing was done on that system.

"The system was becoming ineffective," McEvoy recalled. "All operations at the warehouses were manual. After an order was shipped, it was mailed to us. Because of mail as well as operational delays, we would not get an invoice to the dealer until seven to 12 days after shipment."

Four RFPs Issued

Based on discussions with Raleigh's management, requests for DP proposals were issued to four computer manufacturers and to a company offering remote computing services. All of these companies had the potential of providing Raleigh with a viable solution to its DP problems.

Each firm was asked to provide Raleigh with an approach that would most effectively satisfy the bicycle supplier's requirements for the next four to six years. In addition, they were all requested to demonstrate their systems and submit the names of other companies that were successfully using the system proposed. Each proposal was analyzed in terms of relative advantages and disadvantages.

Raleigh chose a mixed-vendor system consisting of a Burroughs Corp. B1830 host system for the Boston office and five NCR Corp. 8230 minicomputers at the warehouses. The host computer was chosen because the vendor was designing an interpreter that would allow existing programs to be run without any modification, thus protecting the company's programming investment.

"Our objective was to concentrate our efforts on getting the warehouse computers installed and rewrite the Boston office systems in Cobol later," McEvoy stated. "Programming of the minicomputers was an important factor. We wanted Raleigh's participation in the development of any proposed system to be minimal in the initial conversion stage."

Minimal Changes Necessary

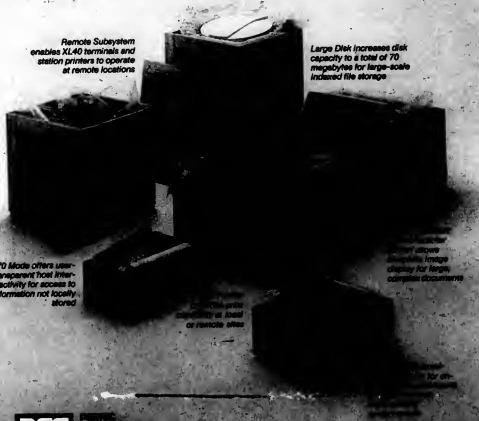
NCR proposed its Interactive Wholesale Distribution System (IWDS) program package, which could be installed on the minicomputers immediately and would closely match Raleigh's needs. The only changes required were modifications in invoice, credit memo and statement formats and a change in the pricing structure.

(Continued on Page S/44)

WE COULDN'T KEEP THE LIDS ON ANY LONGER!

The XL40 delivers powerful, concurrent, transaction-oriented distributed processing for your management network. With a series of new features specifically designed to solve your long-range needs.
More accessibility, with 3270-mode host interactivity to permit retrieval of data not available on local XL40 files.
More expandability, with up to 512K bytes of memory and 70 megabytes of disk, combined with our turnkey software, to offer an exceptional application range.
More versatility, with terminals and station printers that can be local or remote, and operate just as if they were XL40 cable-connected, wherever phone lines can be installed.
More flexibility, with both 480-character production screens and 2000-character large document screens, so we can configure the optimum mix for your requirements.
More source capability, with station printers under user program control that combine keyed data with disk file information to provide hard copy at local or remote sites.

XL40 DELIVERS DDP FASTER, FURTHER, EASIER



Remote Subsystem enables XL40 terminals and station printers to operate at remote locations
Large Disk increases disk capacity to a total of 70 megabytes for large-scale indexed file storage
3270 Mode offers user-transparent host interactivity for access to information not locally stored
allows image display for large, complex documents
print at local or remote sites

PCC

More Good Jobs Predicted

DDP Offers Prospects for Data Entry Manager

By William G. Moore Jr.
Special to CW

Distributed data processing (DDP) will make top management dependent upon the knowledge and expertise of today's data entry managers. As a result, the movement to DDP over the next dozen years will create within corporations more good jobs for data entry experts than there will be good people to fill them.

DDP came along just as the key-to-disk marketplace reached its ultimate maturity. If the rate of change experienced in the data entry field continues unabated, precisely what does DDP mean to the data entry manager?

It is apparent DDP is barely in its infancy. We are not seeing any rush to take well-functioning centralized data entry operations and distribute them piecemeal to user organizations.

About 60% to 70% of all applications currently being considered for distributed processing involve jobs that have not previously been automated. This means the vast majority of applications for distributed processing will require knowledge of manual procedures as they exist today, knowledge of error control methods and the ability to design jobs around computer equipment.

There will also be a tremendous data conversion load. Literally hundreds of thousands of manual records must be purged, cleaned up and converted to machine-readable input. This will be a huge data entry job.

Who in the typical computer-using organization is more qualified than the data entry manager to assist in the design of new applications which were previously manual? Who in most organizations is more capable than the data entry manager of implementing tremendous conversions of data? Who in a company knows more about the problems of operator interface with terminal devices? Who knows more about error control and reentry of corrected information?

Internal Consultants

The much heralded office of the future will break down traditional lines of reporting responsibility, especially as they relate to the collection and processing of everyday business data. Many data entry managers will be cast in the role of internal consultants to their corporations. This can be a very substantial opportunity, but will also place tremendous demands upon them.

Most data entry managers have proven in the past to have had the courage and determination to adjust to a changing data entry environment. They will require that same amount of dedication as their companies move into DDP. They will have to deal with new and challenging organizational issues.

Most users are approaching DDP with a great deal of caution, especially the segmenting and partitioning of data bases across remote user areas. That said, literally everybody is talking about DDP and most companies of any size have appointed committees to begin to determine what their approach to this new phenomenon should be.

The consensus forecasted growth of the marketplace through 1985 is approximately 40% compounded annually. It is the fastest growing marketplace, more so than mainframe business, and that's why it's attracted so much vendor attention.

There has been a shakeout in the data entry systems industry over the past seven years, and the same kind of shakeout is likely in DDP. That impending shakeout is something to keep in mind because it presents a particular set of problems for someone selecting equipment.

Labor costs are rising about 10% per year. At the same time, the costs of computers and communications have been coming down dramatically. As terminals, modems and long-haul telephone costs come down, the distribution of computing power is no longer constrained by communications costs.

Those trends mean DDP systems involve fewer and fewer hardware dollars as a percentage of the whole. More and more dollars are going into the software and services area, especially for programming personnel.

Data communications will be a key issue in the ability of the data entry manager to grow within his organization. While data entry managers need not have tremendous technical knowledge, they must be able to understand

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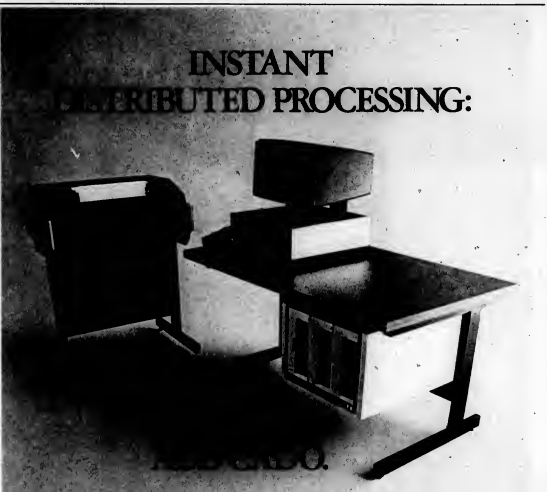
> *'. . . The movement to DDP over the next dozen years will create within corporations more good jobs for data entry experts than there will be good people to fill them.'*


INSTANT DISTRIBUTED PROCESSING:
[illegible]O.

It's the only system that combines computing power and disk storage with terminals made by the Bell System.
It processes data at the source of that data.
It communicates with your mainframe.
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Farah Takes Up Slack in Its System Control

By Robert Bohannon
Special to CW

EL PASO, Texas — At Farah Manufacturing Co. here, we have developed a distributed data processing (DDP) system to handle manufacturing control. The system includes our IBM mainframe, one Hewlett-Packard Co. 3000 and four HP 1000s.

The mainframe interfaces with the smaller systems via magnetic tape. The HP 3000 serves as the central system in the small system network and serves both as a central program storage site and data collection point. The HP 1000 systems reside in each of our three plants here, with one HP 1000 serving as a programmable network controller.

Production orders enter through the HP 3000, which breaks them down into cut orders (the apparel industry term for production orders) and assigns cut orders to each plant through communications with the resident HP 1000. Along with the assignment, the bill of materials for each part of the order is transmitted to and exploded by the HP 1000 to issue the production control materials necessary to keep track of progress on the order.

Each of the small systems transmits updated production data to the central HP 3000 daily. From the collected data, a report of production by order, part and operation is generated every day. Using the Image data base management system and Query language inquiries, operators at the central site extract information on any order or operation at any time.

Manufacturing Control

We call the development our Manufacturing Control System (MCS). In the men's clothing industry in which Farah competes, production information has to be processed in a timely fashion if management is to be effective. Distributed processing at Farah increases timeliness by 300% to 700%.

When every order involves numerous fabric, as many as 40 different sizes, up to 10 parts in every size of slacks and 125 operations in putting a pair of slacks together, we have a formidable information task.

On top of all the operations comes the statistical effort to calculate standard costs by operation and compare with actual costs, in order to locate problems. We have to pass summaries of this information along for setting finished product prices and determining our financial position day by day.

The MCS gives us more up-to-date information on what happens within our plants and also a high-speed means of transmitting orders and break cut orders into convenient bundles for processing.

We get detailed daily reports on work in process (down to individual operations and operators) from which managers pinpoint developing difficulties and project delivery schedules.

The information makes operational management easier by focusing on specific problems. We can supply the marketing department with cost data so it can adjust prices. And we supply manufacturing personnel with data they need to find ways of reducing costs.

Used Kimball System

For several years, production at Farah used the well-known Kimball system for production control. The tag used is about an inch wide and has a pattern of small holes punched in it. That small tag began as a four- or five-section strip of tags.

As bundles were cut, sewn, pressed and so on, one section of the strip was removed. The punched holes in the torn-off section were read as part of a batch process to keep track of the work.

Only major operations could be tracked under the system. None of the information was detailed. We could not compute costs before an order was finished or spot snarls involving small parts or individual operations.

The system did provide enough data to project approximate delivery dates.

The turnaround time for data from the older system ranged from two to three days to a week.

As a consequence, we

(Continued on Page S/50)

How can you tell if distributed

Look at the job it's done for us.

Knitter Finds Financial Salvation

Smart Terminals Improve Fabric of Operations

Special to CW

LANCASTER, S.C.— When the installation of dumb card-oriented terminals in remote locations nearly ruined the fabric of this company, the knit division of Spring Mills, Inc. began installing intelligent terminals at its mills and stayed solvent.

Since that time, the division has added more and more capabilities to the systems in the remote locations, showing that distributing processing that allows management to obtain up-to-date information works, according to Richard C. Jordan, systems coordinator.

Four years ago, the management of this firm was ready to scrap the DP equipment installed at the division's two remote manufacturing facilities. Aghast at astronomical DP and consultancy costs, they fully intended to forego further work toward computerization in favor of resuming former manual information handling procedures, Jordan explained.

Today, however, DP plays a critical role in day-to-day business operations.

Two key factors explain the psychological and operational turnabout. First, a new DP team was assigned to the division, a group that understood management's concerns and that could translate management needs into sound DP plans. The other deciding influence was the selection of the right equipment installed at the critical point in 1974.

"The marriage between man and machine has spawned improvements in all phases of our business," according to Thomas Rowell, controller for the knit division.

"In effect," he continued, "we have consolidated reporting responsibilities for all administrative functions within our customer service center, which in turn has enabled our marketing, sales and manufacturing people to concentrate on what they do best.

"Furthermore, it has enabled us as a company to institute better management controls and thereby improve service to our customers as well as to our own field sales organization."

Early Misapplications

"Early problems with the DP function in the knit division were the result, in part, of equipment misapplications," Jordan noted. "Non-intelligent terminals installed at our manufacturing facilities in Monroe, N.C., and Mullins, S.C., with all the attendant keypunch equipment and card readers, were being used primarily as communications terminals to transmit production-type information to one of two IBM mainframes in our customer service center in Lancaster.

"What was needed was equipment that could still handle data preprocessing and communications functions, but which was also less expensive," he added.

After division management agreed to investigate alternative hardware and software approaches, selection criteria was drawn up by Jordan and Leon Boss, systems project manager assigned to the knit division. These included high reliability (since equipment was situated at remote plant locations and backup systems were considered to be prohibitively expensive), ease of programming, ease of training and operation, compatibility with the IBM mainframe and overall system flexibility.

Sycor, Inc. 340s were ultimately selected over other hardware, according to Jordan, because, in addition to meeting performance needs,

(Continued on Page S/54)

processing will work for you?

At Hewlett-Packard, we began distributing the computer workload around our factories in 1967. Then, in 1971, we instituted a worldwide systems network that has helped us grow to $1.36 billion in shipments, with 42 percent of our business in computational products.

Today we make 4000 different products at 40 divisions around the world and have offices in 65 countries. This rapid financial and geographical expansion in a highly technical field made the distribution of our data processing an absolute necessity.

We began with the basics.

Small systems went to work in our factories, automating the testing of circuit boards and, later, hand-held calculators. The next step was linking these minicomputers with other factory systems so they could relay data and programs. The obvious need then was to tie these computers into an information network so that key managers could make decisions based on accurate, up-to-the-minute data.

As we continued to grow, we connected our widespread sales offices with the factories. Today we have 130 high-speed communications systems in 94 locations, sending compressed data via satellite and phone lines. About 12 million words a day come into our California headquarters. Yet the cost is phenomenally low. For example, we can send a ten thousand word message to Toronto in one minute for 85 cents. On a teleprinter, it would take 16 hours and cost $800.

We need a system that can change. So do you.

One major reason our distributed processing approach works so well for us is the same reason it will work for you. It's extremely flexible.

You don't have to choose between a star network, or a circle, or a string. Our way, you can have any or all of them. And you can hook up an HP network for as little as $5,000. You won't have to throw out your old equipment, either. Some non-HP computers and peripherals are still carrying a share of our workload. There's no reason why your present systems can't do the same for you.

The keystone of our system is the HP 3000, a powerful general business system. It communicates with the HP 1000, a computer generally dedicated to design, test and control applications in the factory. (Both can also link directly with an IBM mainframe.)

Most long-distance communications between sales office and corporate headquarters are handled by the HP 2026, which can also take care of on-site editing. This keeps information (much of it off-loaded from the central computer) on-hand for local use, shrinking the amount of unusable data funneled to headquarters.

We've just introduced new software for the HP 3000 that makes it an even more powerful management information tool. You can, for instance, sit down at your computer in New York and use all the processing power and data base of your Los Angeles computer—or any other HP 3000 in your network. Software is also available to tie HP 1000 systems together in a plant-wide information sharing network. So you can find out exactly what's going on in your business—from the ground up.

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Programming—that's where you really spend money. We know that from experience, too. We spent hundreds of man-years developing the operating software for the HP 3000. So we're just as interested in protecting that enormous investment as you are. We do it by designing our new systems to use existing software. They'll run your programs faster and more efficiently. Otherwise, you'll hardly notice the difference.

There's not much point in building good computers unless the peripherals are just as good. That's why we make our own printers, video terminals, disc and tape drives, and data entry devices.

If any part of the system does need servicing, we can fix it. With so many Hewlett-Packard offices around, we can respond quickly when you call.

The moral of our story.

It's simply this. If you need to distribute your computer workload across oceans or in your plant, you don't have to go out on a limb. The Hewlett-Packard system has a bright future as well as a pretty impressive past. You can find out all about it by calling your local Hewlett-Packard office listed in the White Pages. Or write to Doug Chance, Hewlett-Packard, Dept. 316, 11000 Wolfe Road, Cupertino CA 95014. We'll send you information on Hewlett-Packard Distributed Processing. It could make a big difference in your company's planning.

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Data Dictionary the Answer to Network Woes

By Esther Surden
CW Staff

LEXINGTON, Mass. — Using a data dictionary on systems in a distributed processing network may help solve some of the problems of data integrity, security, representation and characteristics that users confront, according to David da Costa, president, and David Thomas, vice-president of MSP, Inc. here.

A data dictionary defines the characteristics of the data items that appear or are likely to appear in the network and the relationships between those characteristics, da Costa explained. In a dictionary, the same items can be called by many different names, but different items cannot have the same name.

A dictionary therefore delineates the "language" to be used by those in the corporation, he noted.

Assuming a distributed DP (DDP) environment consisting of a host system and several satellite systems that can communicate both to the host and with each other, an immediate problem arises, da Costa continued. The characteristics of the data received at one end must match the characteristics of the data sent.

Because different types of systems represent data in different ways, users could stream transmissions through a data dictionary and use the dictionary to dynamically represent and convert the data to a form the receiving system can recognize.

The data dictionary acts as an "environmental control tool," taking the data and reformatting it to meet the requirements of the satellite acting as the receiver.

The dictionary can also be used to maintain the security of data within the network. In some situations, management would like to make certain pieces of data off limits to certain users.

With a dictionary resident in a host system that also acts as the network controller, a request for information or to update information could be sent to the host for verification and permission to access, da Costa said.

The dictionary can then dynamically allocate passwords to users. The passwords could be time-limited and purged from the dictionary at a given point, he added.

Using a dictionary in this way "does carry a certain operational overhead," da Costa admitted, but the sensitivity of data in the network may warrant that overhead. An added benefit is the creation of a log file that monitors every inquiry into sensitive data, which may be important for both statistical and auditing reasons.

Data Representation

Because people at satellite systems may not be trained in data processing, they only want to see data by one representation. A data dictionary resident on the host or satellite allows these people to "look at the logical representation of data" without having to know the physical representation, da Costa said.

A data base I/O controller makes physical access to data independent of the program requesting the I/O access; a program can "think" it is retrieving "A" or "B" with certain characteristics, but whether "A" or "B" actually has those characteristics makes no difference to the programmers, Thomas said.

In a typical DDP network, data is both physically and geographically distributed among satellites. The host usually takes summary data from the satellites and produces management reports.

"As we see a growth in the use of distributed processing, we are also seeing a potential for enormous growth in the cost of development of applications," da Costa warned. This leads to management's developing applications at one site and installing them at other areas later.

A problem develops when corporate headquarters needs to change characteristics of the data it wishes to receive, according to da Costa. Management must therefore make sure everyone affected by the change in the characteristics of the data is notified and the change can be made in time to meet corporate deadlines.

One way to do this, da Costa suggested, is to use the data dictionary to check on the impact of the change by determining how many files, systems or programs will be affected. The dictionary can then "send out" the turnaround documents that allow the distributed system to convert the characteristics of its data.

"It's all well and good to tell everybody a week before, 'Change this,' but if management doesn't know how many things will need changing, the satellites are likely to miss their deadlines," he cautioned.

In many distributed processing networks, the satellite points may develop their own sytsems with a high degree of autonomy from the host. In these cases, it may be possible for each satellite as well as the host to have its own dictionary.

The dictionaries can then be modified at predetermined intervals to reflect changes in the characteristics of the data or files on which they are both working.

Using a dictionary in this manner may be necessary because if the remote site is realigning its definitions of data and the host is changing its, they may be transmitting noncompatible data from one moment to the next, da Costa explained.

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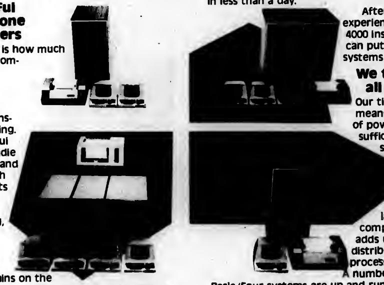

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Focus on distributed processing

Experiments in satellite communications

Distributed Processing: An idea that works

Some consider distributed processing a revolution. Others view it as the next phase in the evolution of dispersing data. Whatever the position, the trend is clear. We are entering an era where data bases and time critical processing are moving to the source of the data.

If you have a task to do, isn't the most logical approach to put the resources where the job is? This is the concept of distributed processing. Move the processing logically closer to the source and user of the data . . . parallel your existing organization with your computing power. With this approach, small computers can respond to local needs, and the mainframe can do what it does best — repetitive, batch oriented processing.

Distributed processing makes sense, because problems in the real world are interrelated, not isolated by department nor restricted to a central location. What happens on your manufacturing floor does, after all, affect your financial accounting.

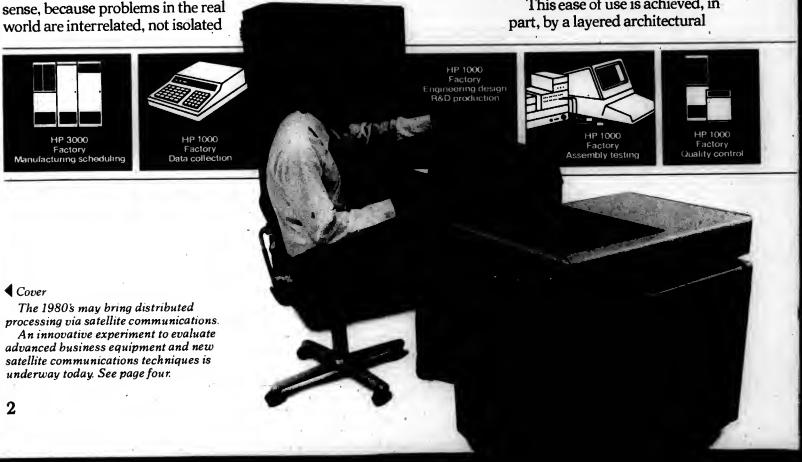
Networks offer advantages beyond this kind of responsiveness to the user — dependability, for instance. If one computer system of the network is down, the organization can continue to function. You can even handle that system failure by routing around it.

Hewlett-Packard was one of the first computer manufacturers to market products for distributed computer networks. In fact, several hundred of our worldwide customers are already using distributed networks.

Today, we have further committed ourselves and future computer products to networks with "HP-DSN" — Hewlett-Packard's Distributed Systems Network. This is a sophisticated plan for interconnecting various computer systems. We are building a line of products with a wide range of processing power, communication speeds, and capabilities. Our goal is to map our computing products onto customers' organizations and network needs.

Since not everyone in your organization is a computer specialist, a primary goal of HP-DSN is that it be useful to operating managers and professionals. The high-level network capabilities are accessed with simple, English-like commands. So the user can concentrate on the solution of a problem and not on the internal workings of the network system.

This ease of use is achieved, in part, by a layered architectural



◀ *Cover*

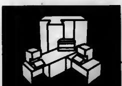
The 1980's may bring distributed processing via satellite communications.

An innovative experiment to evaluate advanced business equipment and new satellite communications techniques is underway today. See page four.

design of both hardware and software. Only the top layer, which provides high-level system services, is visible to network users. The other layers, which provide network communication services, and necessary electrical interfaces, are handled automatically by HP-DSN hardware and software and are transparent to the user.

Flexibility is another advantage of the layered approach. Each functionally independent layer can accommodate new technologies without affecting the rest of the layers. For example, HP plans to interface to packet switching networks using CCITT x.25 compatible protocols. As developments like this occur, they will be implemented in the appropriate layers with no disruption to user programs that communicate across the network.

HP-DSN assumes intelligence at each node. Every member of the network stands by itself and performs a specific processing task—be it an HP 3000 for batch and terminal-oriented data processing, an HP 1000 for real-time applications in the lab or on the factory floor, or an HP 2026 for data entry and communication. Yet, for many applications, the resources of all other members of the network are readily available through that node.


Central
Mainframe

HP 3000
Division
Finance/accounting

HP 3000
Division
Marketing information

HP 3000
Division
Order processing

HP 3000
Warehouse
Product distribution

HP 2026
Field sales office
Remote order entry
and communications

Full implementation of a distributed information network for a company will likely be an on-going process. Networks map onto existing organizational structures which, of course, flow and change. HP-DSN is a strategy that accommodates these changes by redefining, when necessary, the use of the equipment.

Hewlett-Packard is committed to a partnership with its customers to provide the on-going products, consulting, support, and service needed as their distributed processing demands evolve and grow.

DS/1000-The latest link

HP is not new to networking. We have been delivering reliable networks—200, in fact—for the last half decade. HP started with small star networks with fixed command relationships, and moved toward more capable star networks with flexible command relationships.

Now, with DS/1000, we have a truly generalized nodal network which supports a variety of configurations—stars, strings, rings, and combinations.

DS/1000 is a set of hardware, software, and firmware which supports HP 1000 and HP 21MX systems as network nodes which communicate not only with each other, but also with a directly-connected HP 3000 Series II computer.

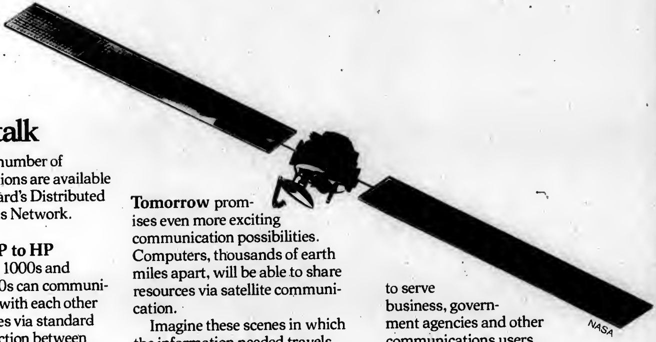
Users can strategically disperse computing power where it's really needed while readily sharing data and application programs. With DS/1000, a remote HP 1000 can be just across the room, hardwired up to 10,000 feet, or across a continent—as far away as data communications facilities reach. All this happens with no significant increase in complexity for the applications programmer. The network information flow is handled entirely by DS/1000.

Both disc-based, RTE-III HP 1000s, and memory-based, RTE-M HP 1000s may be mixed freely in a single DS/1000 network. The same set of network program requests and operator commands are available on upward-compatible RTE-III and RTE-M. To use DS/1000, then, the user does not need to learn more than one operating system.

With a powerful remote command processing capability, users at terminals on one HP 1000 node can access any other HP 1000 in the

Continued on page 8

Distributed Processing: Systems that work together



NASA

Talk, talk, talk

Today, an infinite number of network configurations are available with Hewlett-Packard's Distributed Systems Network.

HP to HP
HP 1000s and 3000s can communicate with each other and with themselves via standard cabling. The connection between HP 1000s, between HP 3000s, and between HP 2026s can also be synchronous modems. The HP 2026 can communicate with HP 3000s with synchronous modems. Plus, the HP-IB interface* simplifies system connections to single or clustered instruments, calculators, or terminals.

HP to IBM
RJE/1000, for the HP 1000 and HP 21MX, emulates an IBM 2780 remote batch terminal to many IBM 360 and 370 systems. Communication between the HP 3000 and IBM hosts is provided by a 2780/3780 Workstation Emulator.

HP to Terminals
HP networks support local terminals via a standard cable; remote connections are provided by full duplex modems, and also by half duplex modems for the HP 3000. These connections can also accommodate special purpose terminals such as calculators, data entry devices, and badge readers.

Tomorrow promises even more exciting communication possibilities. Computers, thousands of earth miles apart, will be able to share resources via satellite communication.

Imagine these scenes in which the information needed travels nearly 50,000 miles, to and from a satellite, in only a few seconds:

Personnel at an Eastern site instantaneously view a financial graph stored on disc at a Western site.

Two people, at two different host sites, call for a contract stored on disc at one of their sites. They simultaneously view and discuss its provisions.

A high speed file transfer from a remote computer system backs up and restores a lost data base on the local system.

These transactions are being tested and evaluated today by Project Prelude—an innovative business communications experiment which adds high-speed satellite communications capability to business equipment. The overall coordinator of the project is Satellite Business Systems (SBS), a partnership formed by wholly-owned subsidiaries of COMSAT, IBM, and Aetna Life and Casualty. SBS has been authorized by the FCC to establish a domestic satellite system to serve business, government agencies and other communications users.

Three companies are hosting this series of experiments: Rockwell International Corp., Texaco Inc. and Montgomery Ward & Co., Inc. The HP 3000, with DS/3000, was selected by Prelude as the computer system to be used in the project. It is one of the few computers available today with vendor supplied network communication software.

In addition to the data processing experiment, other tests feature the use of television in a two-site business conference, and the rapid transfer and broadcast of documents using facsimile equipment. Again, HP 3000 computers and DS/3000, the network services software, are being used to demonstrate the data processing aspects of each experiment. Network data base management, and network information transmission, storage and retrieval are done interactively between two HP 3000s.

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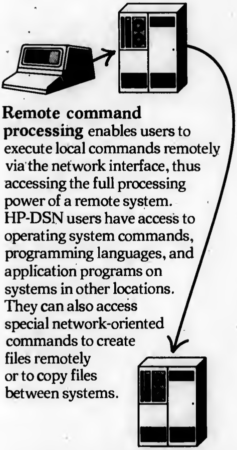
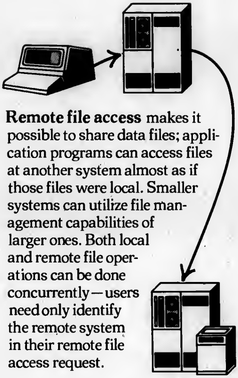
*HP-IB is Hewlett-Packard's implementation of IEEE Standard 488-1975—"Digital Interface for Programmable Instrumentation."

Remote possibilities

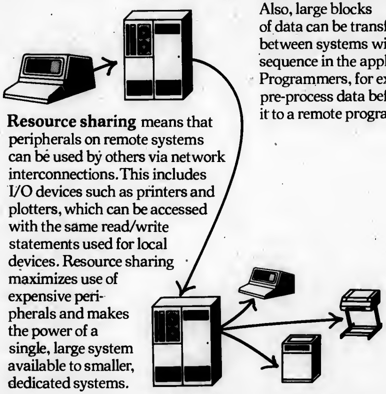
Four high-level capabilities of HP-DSN dramatically increase resources available to HP 1000 and HP 3000 users. They can execute local system commands remotely, have access to data files residing on remote systems, communicate between programs, and share expensive peripherals. These capabilities lever the effectiveness of any programmer on any system in the HP Distributed Systems Network.



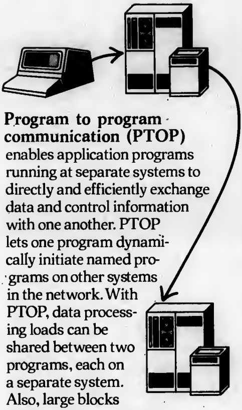
Remote command processing enables users to execute local commands remotely via the network interface, thus accessing the full processing power of a remote system. HP-DSN users have access to operating system commands, programming languages, and application programs on systems in other locations. They can also access special network-oriented commands to create files remotely or to copy files between systems.



Remote file access makes it possible to share data files; application programs can access files at another system almost as if those files were local. Smaller systems can utilize file management capabilities of larger ones. Both local and remote file operations can be done concurrently—users need only identify the remote system in their remote file access request.



Resource sharing means that peripherals on remote systems can be used by others via network interconnections. This includes I/O devices such as printers and plotters, which can be accessed with the same read/write statements used for local devices. Resource sharing maximizes use of expensive peripherals and makes the power of a single, large system available to smaller, dedicated systems.



Program to program communication (PTOP) enables application programs running at separate systems to directly and efficiently exchange data and control information with one another. PTOP lets one program dynamically initiate named programs on other systems in the network. With PTOP, data processing loads can be shared between two programs, each on a separate system. Also, large blocks of data can be transferred between systems with a simple call sequence in the application program. Programmers, for example, can pre-process data before transmitting it to a remote program.

Distributed Processing: It's working for our customers

> **"The only way a computer system will become a true success is for it to be totally integrated into the operations of the user area."**

Patrick Daniel
Automated Systems Superintendent
Hudson's Bay Oil & Gas Co. Lmtd.

"It seems to me it is always more logical to provide a facility where it's needed rather than centralizing it. Before, due to costs, this wasn't feasible. The economics have definitely changed."
Patrick Daniel—HBOG

"It's really very basic . . . we split up the information handling function to reflect the way the organization operates."
C. Guruprasad—Supply & Services, Canada

"We saw some real advantages to the user having essentially his own machine. He can run and schedule it according to his own needs, and not fit into a complex, large system schedule where his priority may not always be what he'd like it to be."
Gary Specker—General Mills, Inc.

"Our concept is to push more and more of what is useful to the user, back towards the user. By distributing the data bases closer to the action, users can manipulate the information at their own timings and frequencies."
C. Guruprasad—Supply & Services, Canada

"This makes the computer responsive to the manager, rather than the manager responsive to the computer." *Al Viste—Boeing Co.*

"It used to be that you had to have highly experienced computer experts wherever you had a computer. That's no longer so."
Gary Specker—General Mills, Inc.

"One of the reasons I picked the HP system is because it is "docile" —it's teachable, and can be managed by non-EDP professionals."
Al Viste, Boeing Co.

"People tend to accept computers more when they are located within their own grasp. It's a lot like the hand held calculators. In previous years you had a few calculators located centrally. Now just about every engineer, scientist, or accountant has one sitting on his or her desk." *Patrick Daniel—HBOG*

"I'm not one who believes you can plan the whole thing out for five years and then implement a piece at a time. But you can set a direction and control the evolutionary development."
Gary Specker—General Mills, Inc.

"The beauty of a distributed system is that you don't have to tackle the entire, huge complex job all at once. You can break it up into manageable bits." *Patrick Daniel, HBOG*

"There are ways to do the job today that weren't there even two or three years ago. You have to ask yourself: Is there a better way to do this than just increasing the size of the large central computer?"
Gary Specker—General Mills, Inc.

"You select your equipment according to the job. You wouldn't send a semi-truck out to pick up 100 pounds in an alley. A general purpose mainframe is trying to satisfy all problems. To make a great big semi work like a pickup, you have to spend a lot of time programming it."
Al Viste—Boeing Co.

"You really don't need a computer that's any larger than the largest job you have to do."
Gary Specker—General Mills, Inc.

"The dynamics of a living organization tend to cut across simplistic organizational boundaries. Organizations don't operate in a centralized, monolithic fashion. Data processing must be able to change in order to represent the reality of the operation. Otherwise, you can't survive."
C. Guruprasad—Supply & Services, Canada

> **"A distributed system gives us the flexibility to change as business needs change."**

Gary Specker—Director of Systems &
Data Processing, General Mills, Inc.

Hewlett Packard

"If we are wholly dependent on the mainframe for the more dynamic parts of the system, it takes us a long time to make changes and to respond to changing management requirements." *Al Viste—Boeing Co.*

"We chose a distributed network, rather than a large central batch machine, to have a completely fail safe system. If any one element failed, another part could take over."
Alain Faveau, CAMIF Co., France

> **"When you're tied centrally and your machine's down, everybody's down."**

Dennis Eickhoff—Vice President,
Systems & Data Processing,
Nationwide Financial Services Corp.

"EDP capacity of the corporation is less vulnerable with the distributed arrangement . . . multiple boxes allow for a higher degree of backup."
Gary Specker—General Mills, Inc.

"With HP's DSN software, the user merely declares himself a remote user and he can access the data in any of the other network nodes—that is, as long as he's legally authorized to get access. You get the feeling you're working on a large mainframe because you're able to easily switch from one machine to another. The fact that you're switching is transparent."
C. Guruprasad—Supply & Services,
Canada

> **"With DS/3000, any one of our four HP 3000s can communicate with any other in the network."**

Alain Faveau, EDP Manager,
CAMIF Co., France

"I don't have to worry about protocol; I depend upon HP's DS/3000 software to talk to IBM, and to talk to other 3000s."
Al Viste, Boeing Co.

"What we saw in HP was a company with a very clearly defined growth pattern for their computer systems and distributed processing networks. The kinds of things we were wanting to do with the computer were exactly the kinds of things HP was selling their computers to do."
Gary Specker—General Mills, Inc.

"Any company looking into distributed processing should very strongly consider the vendor's commitment to the concept."
Patrick Daniel—HBOG

"I played it conservative in selecting a vendor. HP is moving ahead in the technology and they have a reputation for not playing on futures . . . you know, like giving me a bunch of promises that may or may not come true."
Al Viste—Boeing Co.

"It's important to realize distributed processing is a two-way street. You should determine whether the vendor is going in the direction you want to go."
C. Guruprasad—Director,
Corporate Systems Branch,
Supply & Services, Canada

> **"We're not leaving the IBM fold since we still use it as the central system."**

Al Viste—Finance Systems Manager,
Boeing Co.

"If you're going to enter a fairly new area such as distributed processing, you should have vendors who you have some faith in that they'll be around in say three years."
Dennis Eickhoff—
Nationwide Financial Services Corp.

"The more you satisfy people, the more they demand. I think, customers will continue to expect HP to provide more and more of the systems, and software necessary for distributed processing."
C. Guruprasad—Supply & Services
Canada

> "People are really talking about Hewlett-Packard's Distributed Processing.
>
> Isn't it time you talked to us about it?"

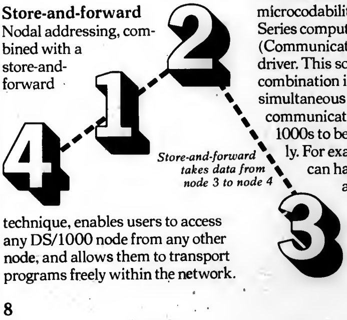
DS/1000-
The latest link (continued)

network, local or remote. These users can easily utilize files, programs, and peripherals on other nodes, even when they are unattended. Individual HP 1000 nodes can be connected in any manner that suits the material flow of a plant or geography of a region—a star arrangement surrounding a central node, a ring, a string, or any combination of these. Nodes are connected with either a single four-wire cable or by full-duplex modems.

DS/1000 is particularly well-suited for instrumentation, computation, and operations management tasks in functional areas such as manufacturing, R&D, quality control, and distribution. Moreover, DS/1000 to DS/3000 communication facilitates the integration of these tasks with commercial data processing functions available on the HP 3000 Series II, such as production scheduling, order processing, and accounting.

Store-and-forward

Nodal addressing, combined with a store-and-forward technique, enables users to access any DS/1000 node from any other node, and allows them to transport programs freely within the network.



Store-and-forward takes data from node 3 to node 4

A user at a node in New York, for example, can write to a line printer at a node in Boston. If the user later transports the program from New York to a node in Atlanta, the same line printer in Boston would be accessed, without change to the user's program.

The application programmer need only identify the node where the printer is located, and DS/1000 forwards the information from node-to-node until it reaches that address. The DS/1000 software only needs an organizational chart of the network, the "Network Description Table," to define the inter-connections between the nodes. That's forward.

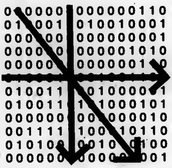
"Store" indicates that the data stops briefly at each node. This store-and-forward routing is completely handled by the DS/1000 software, relieving the programmer of the need to write communications.

Microcoded Driver

DS/1000 takes advantage of the microcodability of the HP 21MX Series computers in its CAM/1000 (Communications Access Method) driver. This software/firmware combination is fast enough to allow simultaneous requests on multiple communications lines between HP 1000s to be serviced concurrently. For example, a DS/1000 node can handle four concurrently active 9600 baud lines, or two active hard-wired lines with a combined effective throughput of up to 20K-bytes/second.

Tri-Directional Error Check

To ensure data transmission integrity, DS/1000 incorporates a powerful error checking method. Data blocks, when received, are checked simultaneously for vertical, longitudinal, and diagonal parity. This block error checking scheme can be done while maintaining high-speed communications because it is implemented in microcode.



An initial DS connection between HP 1000's is $6200; subsequent connections are $3700. A DS/1000 node can connect with a DS/3000 system for $1250.* **For more information on Hewlett-Packard's Distributed Systems Networks, return the attached reply card.**

*Domestic U.S. prices only

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More Engineers, More Locations

Equipment Vendors Offer Best Bet for Service

By Fred Valfer
Special to CW

The term "distributed data processing" (DDP) could have been invented by Humpty-Dumpty. It was Mr. Dumpty, as one may recall, who said, "When I use a word, it means just what I choose it to mean, neither more nor less."

DDP vendors all use the term exactly the way they choose it to mean. However, one thing is clear — users are getting more responsibility, and more power, to do their local processing.

With this new freedom goes an obligation — to maintain the equipment at a level equal to that of the mainframe. Most users of such equipment are finding out that DDP systems are as important to remote operations as the CPU is to headquarters.

Before making an investment in multifunction systems for dispersed locations, therefore, a user should not only carefully examine a vendor's equipment, but its field engineering organizations as well.

A prime consideration in selecting a multifunction vendor is whether its service organization can keep pace with the user's network growth. That capability is dependent on two factors — the number of field engineers and their geographic location.

The former is largely a function of the number and sophistication of the systems installed; the latter, of the vendor's market penetration.

The important thing is for the user to match his needs to a vendor's capabilities. If the user has systems in cities like Detroit, Cleveland and Dallas, he doesn't need a vendor with 200 service centers.

If, on the other hand, he has a network that spans the continent, he's probably not going to be satisfied with a vendor who only has a regional service capability.

Other Options

Some users have tried to get around this problem — because of their investment in a particular piece of equipment — by using third-party maintenance vendors. In some cases, it has worked. In others, the lack of trained personnel and their unclear commitment to a user's needs have inhibited the success of the operation.

As a practical matter, it seems prudent to use third-party vendors only when they are trained by a DDP vendor which finds it economically unfeasible to station its own people in places like Moose Jaw, Saskatchewan.

Other users have opted to maintain their own equipment. In the case of centralized or highly technical organizations like engineering or aerospace firms or some government agencies, the project has succeeded.

As companies have become geographically dispersed, however, the distance places added burdens on the company's resources, burdens which are more easily satisfied by DDP vendors.

In general, well-established vendors will have their own field engineers to maintain their equipment. This approach offers several advantages: users get the assistance of experienced company employees who are well-trained on the company's equipment (in some cases for as many as 20 weeks of in-class training) and represent the company's commitment to DDP. On the other hand, vendors gain better control over their own equipment and resources, thereby allowing greater utilization of them.

> *A prime consideration in selecting a multifunction vendor is whether its service organization can keep pace with the user's network growth. That capability is dependent on two factors — the number of field engineers and their geographic location.*

Another advantage, often overlooked, is that a vendor's own field engineering force can and does offer total support, providing software as well as hardware capabilities. In a world where everybody's hardware is beginning to look alarmingly alike, it's no longer enough for a field engineer to be able to just fix a hardware problem or replace a board; software makes the difference. Yet software problems are usually much more difficult to detect.

When a piece of hardware is shipped from a factory, it is usually well tested. The only unusual problems of difficulties encountered are design ones which can be field-adapted and later engineered.

Software, however, although it may be totally debugged by the vendor, is always subject to adaptation by the user — adaptations which can bring down the whole system.

Unless the field engineer can provide both hardware and software support, therefore, users only get half of their problem solved — a situation analogous to throwing a 50-foot rope to someone drowning 100 feet away.

Minimizing Downtime

Once the user has identified the

(Continued on Page S/34)

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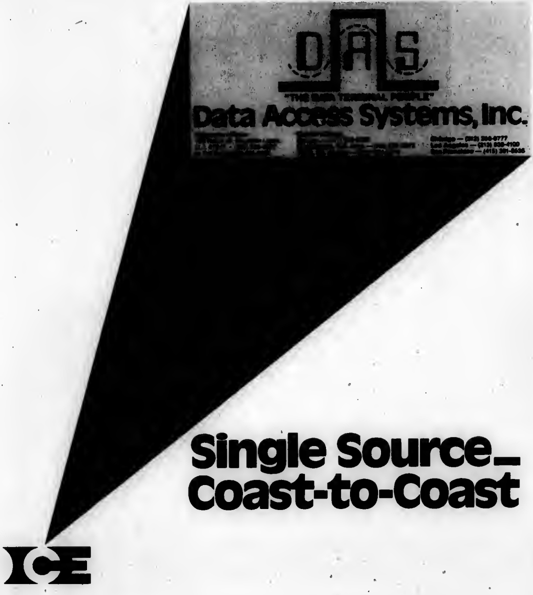

Chemical Firm Gets Real-Time Inventory Boost

(Continued from Page S/4)

U.S.

Customers are invoiced daily and remit payments through the corporate accounts receivable system on the System 370 in Ardsley, N.Y., which has been updated by information from the System 3.

The system was designed to work through a centralized division order processing department and to use an on-line approach to inventory management while leaving back-end processing on the large mainframe.

Benefits Accrued

This distributed processing system has improved customer service by providing an immediate response on order status. In addition, it has improved inventory management by reducing inventory investment, providing central control of stock replenishment and allowing immediate access to information regarding inventory status.

Other major benefits include a rationalized staff, automated picking lists for warehouse personnel, reserving of drums or batches, good system reliability and a flexible operating schedule.

The system has processed over two million transactions and contains 120 on-line programs. It serves several thousand customers and contains approximately 40,000 drums of inventory representing 1,300 products.

All orders, regardless of source, are entered on an order entry form and input to the system. Inventory is not normally checked before order entry; however, inventory information is available through file interrogation (on-line) or a stock status report if the customer requires such information when placing his order. Required entries on this form are customer number, product number and quantity ordered.

Additional override facilties available at this stage of order processing include such things as price, FOB etc.

All customers orders successfully entered to the system create an order confirmation form on the terminal printer in the order entry area. A shipping paper print record for subsequent printing at the remote distribution center is also produced. These forms contain all appropriate shipping information including drum numbers and warehouse locations where applicable.

It is during this phase of processing that the customer and product numbers are validated and each item of the order is priced. Inventory is checked and selected by the system at this time.

Orders that fail inventory checking are routed to the customer service area for further processing. Through on-line interrogation of nationwide inventory levels and communication with appropriate inventory management personnel, determination of order disposition is made.

Orders can be referred, either totally or partially, to other shipping locations by direct entry into the CRT.

Distribution Functions

All orders successfully entered into the system at Greensboro and which have passed the inventory checking and picking phases of the system, are held in the system print queues to await action by the distribution center. The terminal print program is initiated by the distribution center through CRT entry. This causes all orders to print on the six-part shipping form.

The warehouse picks the order based on information printed (drums and locations), labels the drums with appropriate customer information and arranges for pickup by carriers.

Upon completion of the shipment, remaining paperwork is routed back to the distribution center office for matching to the control document and CRT entry of notification of shipment. This entry updates the drum inventory and creates a computer record for invoicing.

Daily Report

Each day the system generates a "below minimum inventory" report which indicates potential replenishment situations. In addition, a preliminary stock order is also generated in the system for each entry on the report. After reviewing the report and other related information, the inventory control group activates or rejects these preliminary stock orders by direct entry through the CRT. Purchase orders are maintained by the system and may be modified, added or deleted on-line. Having all purchase order and inventory information in the system gives a total picture of product availability.

All master files necessary for order processing as well as the open order file and the location transaction file are maintained on the IBM 3 using on-line programs. Throughout the day, while order entry is on-line, orders are flagged for processing. When required, the multileaving remote job entry program is loaded.

The orders which were flagged and the applicable maintenance to other files are formatted and transmitted to the corporate data center is Ardsley, N.Y. Upon receipt of the data, it is merged with appropriate data from the other Ciba-Geigy sales divisions and input to the system that generates invoices or maintains corporate files. The data is then passed to the accounts receivable, sales reporting and financial inventory systems.

Robert St. John is a group leader in management services at Ciba-Geigy Corp., Greensboro, N.C.

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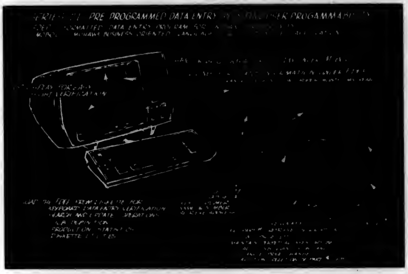

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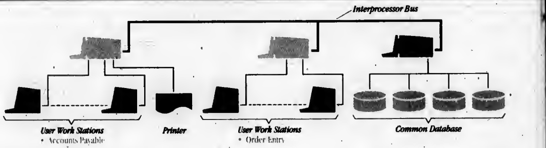
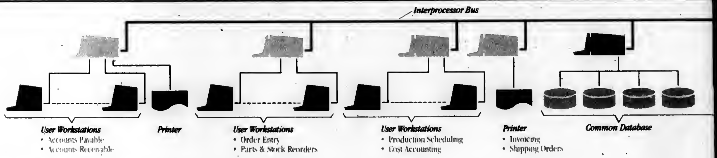
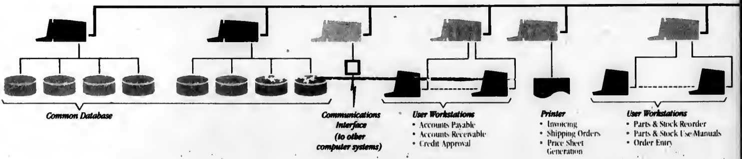
A small ARC system.



A medium ARC system.



A large ARC system.



handling capacity (or speed) needs to be boosted, additional file processors will each provide up to 200 megabytes more disk storage. While preserving the commonality of the data base. And at predictable, economical costs.

Every ARC system comes equipped with user-definable security software that allows each company to restrict access to the data base in several ways.

But the best news is that there is no central processing unit to get bogged down. No single component that will drag the whole system under if it fails. With the Attached Resource Computer, adding (or removing) any attached component requires no system downtime, no re-programming, and no re-training.

Functionally dispersed resources

The ARC System uses an electronic pathway called the Interprocessor Bus to communicate requests and data from one attached resource to another. This communication takes place at such high speeds that applications processors can get the data they need faster than if it were on their local disks. Even though the source of the data may be in another department.

Any number of applications and file processors may be connected to the Interprocessor Bus and located in the offices where they're needed. Each applications processor can have the printers, card readers, magnetic tape, or local disk storage that a traditional computer would have. And each applications processor can be dedicated to its own function, using any of the software in Datapoint's extensive library:

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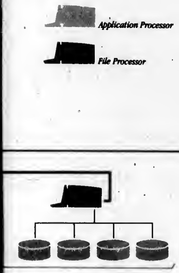
- Telecommunications to other computer systems with Datapoint's networking software.

In fact, ARC even enables an existing IBM 360/370 mainframe to come on-line as an applications processor, using Datapoint's Direct Channel Interface Option.

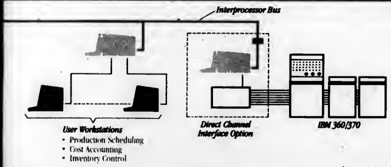
ARC supports all of the functionally dispersed tasks to be carried out at the same time — all on the common data base of the file processors.

Use your imagination.

Take a look at some typical ARC Systems. And just imagine how they could be put to work for you.



The ARC™ System



ARC™ system components

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6600 Advanced Business Processor, 120K user memory, supports all Datapoint peripherals and up to 24 user workstations.

5500 Advanced Business Processor, 48K user memory, supports all Datapoint peripherals and up to 16 user workstations.

6000 Series Attached Processors, 60K or 120K user memory, supports all Datapoint peripherals and 16 or 24 user workstations.

3800 Series Attached Processors, 60K and 120K user memory, for single-user data processing, data entry, and telecommunications.

1170 Dispersed Processor, 48K user memory, supports Datapoint peripherals and up to 4 user workstations.

1150 Dispersed Processor, 24K user memory, supports all Datapoint peripherals.

Peripherals

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20MB Cartridge Disk drive, up to 160MB per processor as a local or common database

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80 or 160 cps Freedom Printer
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Software:

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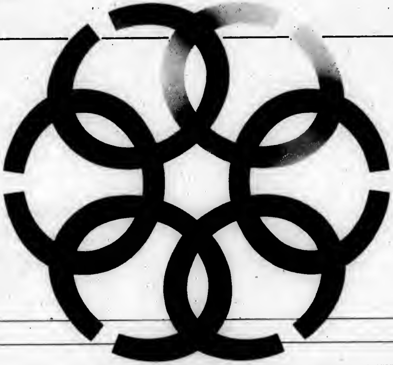

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Do Your Homework, Users Advised

DDP: Make It a Byword and Not a Buzzword

By Leonard J. Hawkins
Special to CW

If a trip into the Land of Distributed Data Processing (DDP) is undertaken as a giant leap, uncharted and loose ended, DDP will surely end up as only a buzzword.

We have seen many such leaps occur through the years which were reasonably successful, even though accomplished in just that manner. You had better forget those successes in any effort you mount to install DDP.

You may recall the DP community took such a leap from unit record gear to computers. We had a built-in advantage that time in that we really had everything to gain and nothing to lose.

DP was not then having any large impact on the way a business was being run. DP budgets were a mere speck on overall costs of running the business.

We were handling some fairly large volumes of number-crunching applications, which in some cases freed people up to do more productive work, but applications were simple in nature.

At that time, there existed no instances of a management information system (MIS) as we know it today. So we just jumped right in and converted the punched card applications to computer programs. We were thereby able to speed up calculations and print times and make DP an even greater mystery to management and the user.

We came out smelling like the proverbial rose because we saved some time and money. We didn't, however, improve what we did for the business management area.

Much at Risk

Now, however, we have seen and lived through a tremendous upswing in technology, education and forced recognition of DP. In many companies, DP and MIS have had a great impact on the growth of companies throughout the world.

We are now moving into an era where a major change in systems technology can lose millions if improperly handled. It is even conceivable that a move to Data Base and DDP technologies could lose a company. Such a move will cost large sums of money to initiate and must be made with care.

Successful implementation of DDP requires involvement not only of DP people, but also the full understanding and support of upper management, followed closely by the support and involvement of the user community.

As a DP venture, DDP will die without those ingredients. DDP must be user-oriented.

No leap, in this case, is possible. It requires careful planning on a much greater scale than we have ever previously undertaken. A detailed study of each application by both the DP department and users must be made to determine which of them should be distributed.

The first question should certainly be cost effectiveness. In each case, will the application require real time, or will shadow files be sufficient?

The cost of distributed networks and of data base technology makes it imperative to omit noncost-effective jobs. The effect of off-loading mainframes must also be considered. Main memory is decreasing rapidly in cost, and off-loading a center could prove to be a bad move.

A good tool for making the decisions on which applications to distribute could be the preparation of a matrix. One side of the matrix might represent all the data elements contained in a data base; the other would represent each existing application.

Taking each matrix-matching block of the entire chart, one at a time, an in-depth study can then be made of all the effects of data on a particular application. From that study, a final, clean decision can be made as to whether the application is a viable one for conversion to distributed processing.

Completely independent of but following the above selection process, each application selected for conversion must answer the criteria for being off-loaded from the mainframe. If it is highly manipulative and heavily processing-oriented with minor input/output involved, it should be crossed off the list. As previously mentioned, main memory technology is advancing by leaps and bounds with dramatic cost reductions.

If, however, the application consists of fairly large amounts of input, a small quantity of processing and large output, it becomes a very good candidate for DDP. The cost of telecommunications is higher than that for main memory.

At this point, when you have put all applications to the test as outlined, you should have a viable list of your potential application candidates for conversion. A review of the remaining list will immediately point out whether you continue with the planning and implementation.

If this seems a long and costly exercise, it will be, but the resulting DDP system will be good, and it will be cost-effective.

Once the application review is complete, it is necessary to choose the one systems application which will act as

(Continued on Page S/38)

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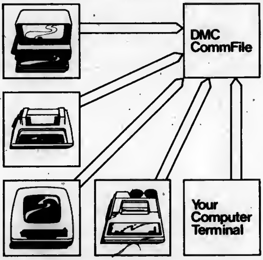

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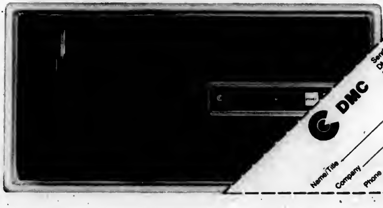

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DDP Holds Promise for Data Entry Managers

(Continued from Page S/7)

the jargon and interpret what is going on around them. It is also likely they may have to learn a programming language, perhaps Cobol.

There are three fundamentals data entry managers planning for DDP should consider. These include, first and foremost, productivity.

Most experienced managers have found themselves at one time or other trying to take a poorly designed manual system and mechanizing it in the hopes of increasing productivity. Those who have done so have seen the disaster than can result. There is a parallel situation in DDP. A poorly functioning centralized system cannot be effectively "distributed."

In addition, the productivity of distributed systems must be measured by different criteria than, perhaps, those which data entry managers have previously used. Productivity in a distributed system might be measured in cash flow or in terms of order turnaround or inventory levels. It will not be measured in keystrokes per hour, but it will nonetheless have to be measured.

Second, product potency is key. There are a lot of products in the marketplace that look very good, but they are quite simply out of gas in terms of their ability to support future applications.

Not every vendor has good hardware. If you look at where we're going with hardware architecture, you'll know that 8-bit architecture is old, 16-bit machines are "in" and 32-bit processors are coming. Those facts should be considered by users looking at potential equipment acquisition.

The third fundamental consideration for data entry managers is product life expectancy. As noted, approximately 70% of the applications under consideration for distributed systems have never been mechanized. Will the systems selected and implemented for those jobs be able to support the eight- to ten-year life expectancy necessary to justify even the initial cut at distributed processing? Or will they be designed to handle only that first application?

About 80% of all activities that can be expected to go on in a distributed processing network involve the following kinds of things: data entry, the ability to take data in an English language form and convert it to some form of machine-readable input; the validation of that data, from the most simple edits to the most elaborate checking and extensions currently handled on the mainframe; and, finally the control of data flow.

Users should consider how the equipment they select helps them perform data entry and do the kinds of validations and editing they want to do on the data and how the equipment can help them control what is on the network.

Transaction Mentality

It is important to realize distributed processing talks to transaction processing. It does not talk to batch processing.

Perhaps an example will help. Take 10 orders that come for processing. In a batch mentality, those 10 orders would be batched, a control document might be affixed to them and they would be sent to a central site for input to a computer. After processing, reports, bills of lading and shipping documents would be generated.

In distributed processing, the emphasis is on transaction processing. Taking those same 10 orders, each would be fully processed in and of itself at a local site and update information would be sent forward to a central data bank.

The transaction mentality is vital to DDP, and procedures are necessary whether batch or transaction work is performed. DDP equipment vendors must bolster the user's ability to develop those procedures.

The productivity of DDP systems will not occur unless it is planned beforehand. It will not happen as a natural by-product of distributing. We are already seeing sites that are "undistributed," sites that were centralized, went distributed and are now recentralized.

Part of the problem was productivity — they achieved no productivity increases. The hardware and software costs went up and managment perceived that after a valiant try at being at the leading edge of distributed processing, they were going back to the way they did it before.

When data entry managers begin to plan for DDP, they must begin to plan the productivity associated with their networks. Data entry managers are well equipped by experience to handle much of those planning tasks, and it is the responsibility of system vendors to help them in that effort.

Moore is vice-president of domestic operations at Inforex, Inc. of Burlington, Mass.

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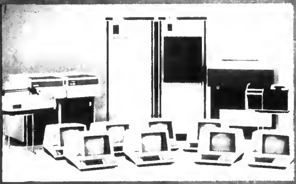

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The new PTS/1200 MARK•I and MARK•II systems bring the second generation of distributed processing to computer users.

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2. Large capacity peripherals

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3. Advanced source data entry capability

A new parameter driven source data entry package permits non-programmers to set up data entry jobs. It incorporates a full range of edit, arithmetic and logical functions. The package lets users apply standard PTS/1200 equipment to many document conversions, editing, local storage and batch control tasks. The source data entry system, while not intended for high-volume keypunch room usage, can with minimum user procedural change be adapted to handle more easily a substantial amount of the source data entry and conversion work now done by assorted other devices. All concurrently with the batch and interactive communications that makes the PTS/1200 the first of the new generation distributed processing systems.

~~4. Five unique~~ network productivity features

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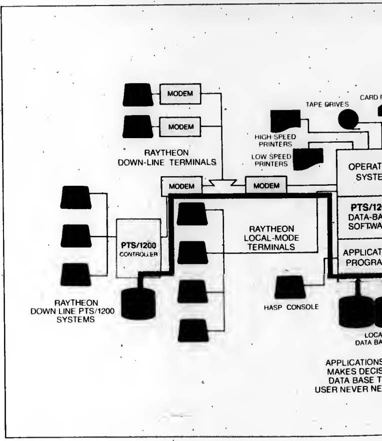
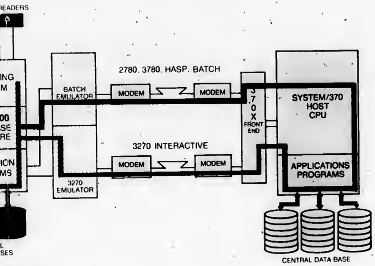


new PTS/1200 MARK·I&II



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five novel network support aids

- A **downline terminal facility** lets your PTS/1200 run a multipoint network of PTS-100 and PTS/1200 systems under 3270 protocol independent of a host mainframe. This allows further distribution of processing power to even your smallest sites
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- An **enhanced software editor** incorporates significant facilities of IBM TSO software It assists users to develop programs for their host computers by pre-editing on PTS/1200 systems. As code is developed and stored locally, it can be batched and sent to the host for analysis, editing and debugging —thus eliminating a high percentage of the message traffic and host overhead support now needed under TSO to support remote program development tasks
- A **remote debug facility.** With it, operators at the host PTS/1200 site can patch or debug programs operating on downline systems or terminals In just minutes, not days And without having to send staff personnel into the field
- And **downline program loading.** A facility that permits transmission of programs from central to remote sites A nice extra that saves time and money

5. Intelligent 3270 operations

Raytheon built its data systems business by emulating, and then by extending, the capabilities of 3270-type products. Within the PTS/1200 family, you can grow from basic 3270-type devices to intelligent 3270 type products, to completely concurrent on-line interactive and batch systems, to powerful free-standing local processing systems Only Raytheon offers users a single migration path far into the future

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Coming as part of the future of MARK•I and MARK•II is the addition of interactive COBOL to supplement our easy-to-use MACROL language, and the addition of our new Videotype word processors as peripherals in a shared data base system By the time you are ready for those capabilities, you'll be able to get them all from Raytheon

7. Next, 3274/3276 features

In addition to the enhanced 3270-type capabilities Raytheon now offers, shortly we will be supporting 3274/3276 features on our PTS-100 and PTS/1200 product lines

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Gap Between Idea and Use

If DDP Is So Great, Why Isn't It Everywhere?

By Lawrence Feidelman
Special to CW

The system design concept known as distributed data processing (DDP) is on everyone's lips, but has been implemented by only a few companies.

Conceptually speaking, DDP represents a new generation of DP that will be more oriented to individual users' needs than are centralized systems. Specifically, distributed processing pertains to the division of logically related processing functions among multiple geographical computer systems.

That mouthful simply means multiple computer systems are placed at various physical locations, each doing its own processing.

But it isn't only the processing function that is being distributed; it is the whole manner of interacting with the DP system. Distribution of processing capability also infers the performance of data entry, the availability of data base inquiry to departmental personnel and the presentation of specific management reports at each location.

The end user, not a DP professional, takes responsibility for the system.

For the system designer, DDP also has significant value. It permits both equipment and software to be designed in a modular form (i.e., building blocks). Such modularity clearly improves scheduling and application completeness and permits expandability in clearly defined steps.

In addition, the overall system reliability is enhanced by "system degraded" modes in lieu of total system failure.

If it is everything everyone dreamed about and more, then why hasn't DDP gained widespread usage?

Many problems must be solved before DDP is used as much as it is discussed. In fact, DDP, while heralded by manufacturers, has strained relations between the excited user departments and the protective DP manager — the users see freedom from DP control and the DP manager envisions havoc.

Program Development

Both parties have a point expressed in the following concerns:

Within a central location, the programming staff exists to develop application software. What happens when the computer is placed in the user department and the user can develop his own programs?

The ability to develop programs at widely dispersed locations with any semblance of efficiency and commonality must be a worry. In many cases, the DP department has stated its intention to develop the application programs and transmit them to the remote sites.

But can the creative user destroy his programs as well as the system? Existing programs as well as the data base must be protected from destruction.

On the other hand, new clerically oriented business languages must be implemented to make programming at remote locations relatively troublefree.

System Usage

Since use of the distributed system is now in the hands of non-DP people, a new breed of DP personnel are needed to train these people and monitor operations at remote locations.

Control

A key element of the DDP system controversy is system control over equipment and personnel. Data processing management must deal effectively with the outside world. System operation procedures must be developed and understood by each user.

Beyond these procedures, the system operations must be monitored and that is the crux of the problem. DP people fear a rash of system failures because of misuse. For that reason, each system to be selected must reduce user errors, while it provides clear information on the cause of problems.

Most system problems will have to be fixed remotely. This means management terminals will be tied into the various systems and intelligent people will be required to operate them.

> *'... DDP, while heralded by the manufacturers, has strained relations between the excited user departments and the protective DP manager — the users see freedom from DP control and the DP manager envisions havoc.'*

Computer security has been a major concern in DP. However, problems found in a central computer are magnified in a distributed processing environment. When a large number of people at many remote locations use a system, data transmission between sites and multiple file accesses become a problem. Many opportunities for security breaches exist. For example, wiretapping and stealing of access passwords must be considered by the potential user.

Password Protection

Protection by simple passwords is insufficient. The need exists for low-cost

(Continued on Page S/58)

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Vendors Offer Edge in Providing DDP Service

(Continued from Page S/21)

maintenance approach, he should know how the individual field engineer assigned to him goes about solving his maintenance problems and what the user can do to help.

When the field engineer arrives, the user should give him a clear picture of the problem — whether it happened before, whether it happens often (or under the same condition each time), whether the problem recurs in relation to something else.

For instance, if the outlets feed into the same lines as the elevator, the user will get his share of ups and downs (and don't laugh, it has happened).

If the problem can be diagnosed on the telephone, the user can sometimes avoid the expensive downtime involved when the field engineer has to come out.

If the problem is hardware-related, the field engineer has a wide assortment of tools to help define and isolate the problem. These might include portable oscilloscopes to trace logic signals, communications testers, line analyzers, digital voltmeters and devices to check the temperature of heat-sensitive components.

If it's a software problem, the field engineer may use the system's built-in diagnostics to help solve the problem or, in some cases, determine whether it's systems- or mainframe-related.

As backup, the vendor's field engineer can call the company's stable of troubleshooters who specialize in out-of-the-ordinary problems or access a central diagnostic facility which duplicates and monitors a user's configuration in a controlled environment to help minimize downtime.

Feedback from the field engineers, when combined with reports on nationwide parts usage, failure analyses and trends, can then be used by the vendor's research and development staff to help make the equipment as reliable as possible.

Spare Parts

With the problem isolated and defined, the field engineer needs immediate access to spare parts — many of which he brings along — to fix the problem. This is possible only if the vendor has strategically located spare parts depots; a prospective customer should find out whether the vendor in fact has them.

By maintaining detailed records of comparative failure frequencies and usage, moreover, a vendor can supply its own field engineers with sufficient spares to sustain normal operations and use the depots to replenish the service force or maintain inventories in emergency situations.

If a system has been designed with a modular concept, much of the repair work can be done on a replacement basis with the spare parts. The modular approach not only helps identify the defective parts that can be replaced, but also allows technologically improved assemblies to be retrofitted more easily and efficiently.

Equipment Reliability

The reliability of the vendor's equipment is, of course, of paramount consideration and cannot be stressed too strongly. It's important for several reasons: DDP requires equipment that is sufficiently durable to accommodate constant use.

Used by Non-DP People

The equipment is usually in the hands of non-DP personnel and if something goes wrong, the whole office's operations may be jeopardized.

The best field engineer in the world cannot satisfy a user whose machine is down every day.

One of the best measures of the inherent reliability of a machine is reflected in its mean time between failure (MTBF) as well as its mean time to repair (MTTR). Historically, electromechanical devices which receive a lot of wear and tear, such as line printers, card readers and punches, cassette and flexible disk drives, have a lower MTBF (or are more apt to fail) than do electronics devices like CRTs. They therefore carry a higher maintenance charge.

Lower Failure Rates

The failure rate on electromechanical devices can be minimized, however, by routine preventive maintenance procedures including checking various components, calibrating to compensate for mechanical wear, lubricating moving parts, running diagnostics and cleaning of parts.

Activities such as these can range for once a month for electromechanical devices to twice a year for electronic components, depending, of course, on customer usage.

DDP, by almost everyone's definition, is here to stay. It represents a significant new tool for both users and management to help manage their business more effectively and, in many cases, less expensively. It is not only a vital link between headquarters and remote offices, it is an essential ingredient for remote offices to handle their own applications.

To realize its benefits, however, DDP equipment must be maintained. Selecting a vendor and its field engineering organization which will grow with the user — both geographically and technologically — will help the user reap the rewards.

Valfer is Data 100 Corp.'s general manager of field engineering operations.

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Don't Underestimate Impact

Distributed Processing: Weighing Pros, Cons

By Esther Surden
CW Staff

Distributed processing is applicable to many organizational structures and management styles, and it could have a greater impact on companies than may be readily apparent, according to a report by Kenneth G. Docter, partner-in-charge of San Francisco Bay Area Management Advisory Services at Price Waterhouse & Co.

"Though there is no common definition of distributed data processing [DDP] there appears to be a key conceptual thread which runs through most definitions — the functional distribution of certain data processing activities along logical organizational lines," the report issued by the consulting firm said.

As DDP develops, both data base and DP activities will migrate to remote sites. "With local data structures and processing capability, the local distributed computer will be integrated with and interact with operation control computers," Docter predicted, adding "distributed processing will really 'come of age' as the loop is closed from the operational control system back to the management information system."

Distributed processing fits in with both centralized and decentralized management structures, Docter contended. Because users have local control, a cooperative environment can be assured.

Another advantage of distributed processing, according to the report, is that costs are "generally lower than for comparable capability in a centralized environment" and "are significantly lower" than replacing unique systems. In addition, expansion can be handled at the local site, increasing flexibility.

The "proper" use of specialized software for specific needs can also provide economies in a distributed environment. Because of replicated hardware, backup of existing systems can take place without duplication of costs.

"Downtime becomes a matter of degraded performance or reduced capability rather than a total loss of processing," the report noted.

DDP Negatives

DDP does present some limitations, considerations and challenges, Docter pointed out. For example, "technology has out-distanced management control" and manufacturers can deliver elements of DDP systems now.

With distributed processing, a "potential loss of consistency in the data and the controls and security exercised over the data" is possible and there is also a "potential for redundancy of data."

Furthermore, additional technical personnel may be needed at the remote locations, he said.

In addition, Docter warned, DDP demands cooperation throughout the DP organizations within a company or management may lose control over the DP function.

Among other such possible problems are the accumulation of "an unmanageable collection of incompatible computers and application systems," a "temporary increase in total DP costs as the centralized functions are off-loaded from the 'fixed-cost' central computer," and "ineffective or inefficient applications as inexperienced users attempt to directly utilize the new local computing power."

Overall development costs could also rise "if users fail to build on prior efforts or if there is no central catalog and repository of these efforts." Misuse of resources could result if "users are not required to justify new equipment applications," the report warned.

Minimizing Problems

In order to minimize the problems and assure control over data and data bases, several techniques have been developed, the consultant stated. Standards, policies and procedures could be developed and controlled centrally, he said, and centralized application development would allow no local access or ability to change programs.

Another method would be "joint local and central staff programming task forces" designed to provide "standardization in development." Alternatively, users could appoint an internal consulting staff "to guide the local organizations through projects" or to serve as a programming services resource.

(Continued on Page S/44)

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Plan for DDP Security Now or Pay for It Later

(Continued from Page S/2)

cedure. Again, the identifiers can be used to check that all messages are recovered.

It's impossible to design a totally secure system. There are too many factors that can't be totally controlled — like human interaction and complex transmission facilities. Anytime data is transmitted, switched, concentrated, etc., there are a myriad of ways it can be illegally monitored.

When designing or specifying security features, however, there are three areas where different levels of security can be implemented. These are network accessing; intrusion detection; and data transmission techniques.

Limiting access to the network can be handled fairly easily and inexpensively. Some of the tried and proven methods include passwords and authorization codes, which indicate if the requester and his request are "legal."

Such security can be implemented by verification tables. Since the security is being handled by the software, it's both easy and inexpensive to change passwords and transaction authorization codes on a regular basis, thus providing another level of security.

If merely locking out unauthorized users or requests isn't enough, it's not too difficult or expensive to design routines that will shut down the offending terminal. Messages could also be sent to supervisors identifying the terminal, the user password and the time of the violation. Such security is often enough to discourage all but the pros.

Once data is in the line, it's vulnerable to unauthorized monitoring via different kinds of scanners. The crude devices attach to the line; the sophisticated ones do not.

Some steps can be taken to neutralize such scanners. Users can multiplex transmissions, use synchronous data streams, employ alternate path or rotary line transmissions or resort to data encryption.

Multiplexing messages is not a bad protection ploy, for it makes it fairly difficult to discern what's being transmitted. Synchronous transmission, on the other hand, merely lets the user know when the monitor is attached. (When a monitor is connected, synchronization is upset and errors occur.) What he does about it is another matter.

Halting transmission is not the answer, especially when the numerous reasons that trigger such errors are considered. Designing hardware or software to distinguish error types is a possible solution — but a very expensive one.

Cheapest Security

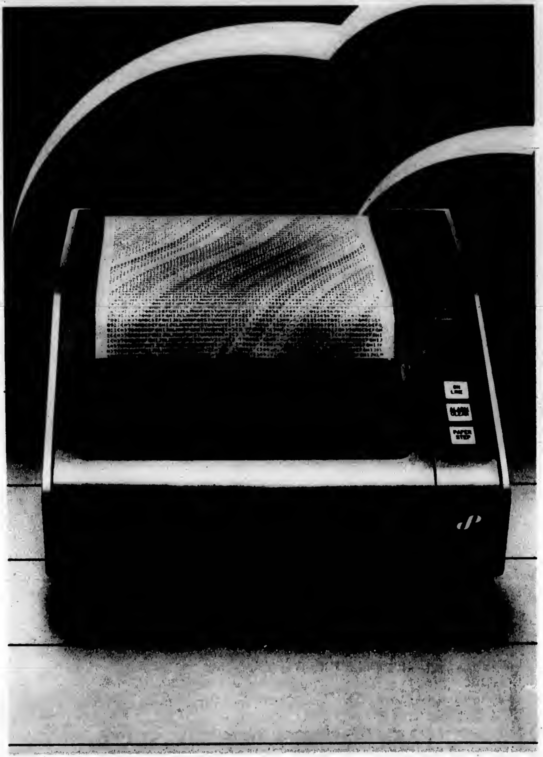
The key to high-level security — and point for point the cheapest to implement — is data encryption.

With the encryption available today, users can choose from packages which scramble data for storage and transmission; many sophisticated data base management systems, also provide encryption which can be used locally and on-line.

Encryption allows almost limitless encoding/decoding schemes. Keys can be changed as often as desired; the encoding algorithms and schemes can be modified; and decoding can be done via pure software, hardware or a combination of both.

In a distributed network, these encoding/decoding schemes could be selectively placed in different terminals at remote sites, thus providing a high level of data selectivity and security.

Hunter is project editor for Auerbach Software Reports," published by Auerbach Publishers, Inc. of Pennsauken, N.J. 08109.



DDP a Byword, Not Buzzword

(Continued from Page S/27)

the pilot. Under no circumstance should more than one area be undertaken until a successful track record has been established. It is important that the pilot project is undertaken with a user group which is enthusiastic and eager to work to make it happen.

A move to distributed data base technology holds massive potential for profit, but it requires a well-planned effort, along with an educational thrust on the part of everyone.

The answer to the question, "is DDP a buzzword or byword?" is purely up to the people involved, and everyone from upper management to the data entry people must be involved. If everyone does his homework, DDP will be a byword.

The technology is here, are you ready for it?

Hawkins is a systems engineer on the management systems staff of Rockwell International, Automotive Operations, in Troy, Mich.

'I Don't Care What Your Computer Says ... My Computer Says ...'

Need Each Other to Succeed

Smart Terminals Go Hand in Hand With DDP

By Gary Sharpe
Special to CW

NORWOOD, Mass. — Just a few years ago, terminals were dedicated devices that performed simple I/O jobs, made no decisions and pretty much left the processing to the host computer. Along with advanced minicomputer and microprocessor technology, however, came the era of the "intelligent" terminal and the potential for distributed data processing (DDP).

Today, terminal intelligence and DDP are tied together in symbiotic fashion: each needs the other to succeed. The more processing responsibility that can be distributed to and handled by the local terminal, the more effective the distributed network as a whole, because the host can spend its time on what it does best — central batch processing and overall network maintenance and information control.

To oversimplify, there is little room for dedicated, or "dumb" terminals as primary nodes in modern distributed networks. The greater the functionality of a terminal, generally speaking, the greater its potential contribution to the efficiency and effectiveness of the distributed network it serves.

Areas of Functionality

For primary-node distributed terminals, functionality can be evaluated in two areas — stand-alone (local processing) power and remote (local-to-host) capability.

Specifically, a powerful stand-alone terminal should be capable of source purification (editing, validation) of data entered locally, so that extraneous or inaccurate data will not be passed along to the host. It should be able to handle concurrent local interactive and batch processing and be able to drive high-performance local peripherals such as large disks and high-speed line printers. In addition, it should allow significant local programming flexibility for storing local data base files and screen-formatting programs.

Not every intelligent terminal needs all these features for a given application, but the greater the functionality range, the better the terminal's capacity for later growth — another important criterion for selecting intelligent terminals for use in distributed systems.

Typical local processing applications for distributed terminals include source data entry, data editing and validation, local file access, personnel and payroll recordkeeping and, of course, local batch processing.

For data entry, editing and validation, the terminal system should allow user-programmed screen-format generation so data can be organized and "automatically" edited, according to system-wide standards, at the time it is being originally entered.

For local file access, the terminal system should be capable of constructing, maintaining and accessing files stored on multiple local disks, and it should be able to output the results by CRT, low or high-speed printer.

For additional local applications, the terminal should offer an efficient, easy-to-use high-level programming language. Cobol is most widely used, but some distributed system vendors offer more efficient languages that are said to do the job of a Cobol program but without the main memory waste associated with its general verbosity.

For local batch processing, the terminal should be capable of automatically scheduling (and performing) unattended batch operations at a time when the terminal's interactive processing activity is at a minimum — typically at night.

Remote Processing

Remote processing applications for intelligent terminals in distributed networks include remote job entry and emulation of various large-computer terminal-device functions. Emulation is important to users who have large central mainframes because a typical emulator terminal will look to the host exactly like the real thing, but will add to the limited processing capabilities of the original device being emulated.

As an example, IBM's 3270 CRT terminal is not user-programmable for multiple applications, nor can it drive a high-speed line printer. Some competing products that emulate the 3270 have a lower price and added features, such as user programming, line-printer interfacing and local editing of source data.

Inherent to effective terminal emulation, as well as to remote processing in general, is the intelligent terminal's ability to communicate using the appropriate communications protocol for the application. Used as a 3270 emulator, an intelligent terminal must communicate via 3270 protocol; in a 360/20 Hasp workstation application, the remote terminal must use 360/20 Hasp protocol to communicate with the host. Synchronous Data Link Control (SDLC) and Pars/Ipars are two other protocols used — and emulated.

A remotely controlled intelligent terminal should additionally be as "controllable" by the host as possible. It should be capable of remote (host) program loading and debugging, and it should provide adequate security "hooks" so terminal access is available

(Continued on Page S/58)

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IBM User Group Describes 'Ideal' DDP System

(Continued from Page S/2)

primary power source.

Given that DDP systems will operate, access and generate system control programs (SCP) in an environment controlled by non-DP personnel, "the SCP must become much simpler than it is today," the report noted. "The present forms of Job Control Language and system generation are unacceptable for use in distributed systems.

Integral Functions

"All functions required for systems control, data base manager, networking, programming languages, utilities, etc., must be integral to the SCP. Functions included in the SCP must be selectable at the option of the enterprise," the report stated.

Further, the SCP "should permit running a job mix where the physical requirements of a job may exceed the size of physical memory and other resources at a given node, and each system module must be both locally and remotely loadable at the option of the enterprise."

Users also require a command language that "is made up of simple and common words, is the same for all users at all nodes, is executable through all terminals and programs" and "has selected commands prohibited to specified users or programs at the option of the enterprise."

The ideal system generation process should be "simple, consisting of specifying minimum information concerning configuration and desired functions" with "flexible generation, loading and testing procedures which can be performed at/for any node/-terminal, as authorized."

The system generation process should provide the facility to modify segments without the need to regenerate the entire system.

Communication Requirements

Since DDP systems use a communications facility that "includes all hardware and software required to support the transmission of data and messages between nodes," users require several functions of such a faciity.

For example, the report noted, peer-to-peer and hierarchical relationships should be permitted. In addition, "a facility to establish communication paths between nodes must exist."

Among other features the communications facility should have are paths concurrently between nodes ... a single uniform standard for communications data descriptions and interprocessor control [and] the capability for a node to initiate communications with any other node in a contention network."

The task force found "encryption, scrambling and other security techniques must be the responsibility of the communications facility and transparent to all users," should "support the transmission of large data sets" and "control the transmission process including any necessary format changes, blocking, buffering, error recovery, etc., resident in the communications facility."

Lastly, the system would optimize "data transfers and present overloading on any individual path," the Share unit noted.

Data Base Needs

A distributed data base manager (DBM) has components which are distributed among multiple nodes. In support of this environment, the task force said, "the distributed nature of the files and system must be transparent to the user."

The appearance of "one logical DBM" should be maintained.

Thus, "regardless of where issued, all calls made to the DBM should be in a common data sublanguage and therefore compatible and transportable; parameters specified for a given request should be identical regardless of the environment in which the request is issued" and "the data sublanguage must be provided in all available languages."

Authorized users must have the "option to generate a nondistributed or distributed data base and/or DBM.

"Selectable features of the DBM "must" allow the DBM to be tailored to specific applications. When less complex options are selected for the system, performance must be improved," the task force said.

One Machine

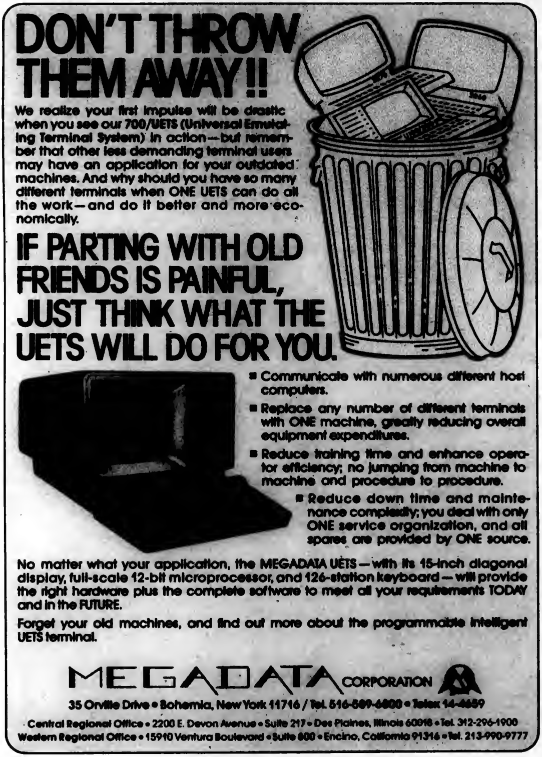
Since most users of DDP systems will have few data processing skills, users cannot be "expected to develop sophisticated technical skills to program the applications and operate the system," the white paper warned.

To this end, the programmer must perceive a program as though it were in a single machine. Programming languages should be "capable across all nodes" and source code compilation and execution "must be compatible with all machines."

Since this implies the same language capabilities available at all nodes, "all languages should access the data base manager and the operating system in a unifotm manner."

The task force determined that APL, Basic, Cobol, Fortran and PL/I should be supported.

In addition, the report noted, user-oriented languages should be developed to support the distributed environment with migration paths provided "through system bridges or sift programs from current [languages] to the new language."



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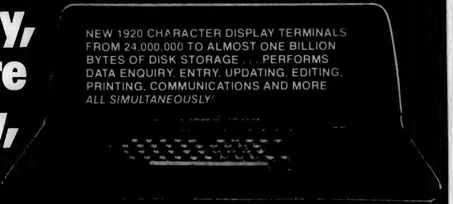
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Raleigh Pedaling Toward Control With DDP

(Continued from Page S/6)

The programming and the minicomputers allow many processing functions to be performed daily at the local level. For example, sales orders are entered into the computer and picking tickets printed for the warehouse. As orders are entered, the accounts receivable data is updated, the stock is automatically reserved and the invoice is printed. The price is set at the order entry time.

Menu-Driven System

The system is menu-driven. This, combined with the full 1,920-char. CRTs, literally leads the operator through each step. NCR trained two operators at each warehouse in an on-site training program and taught general managers and administrative personnel how to inquire into the data base.

Information concerning accounts receivable, inventory and sales orders is available upon inquiry through another terminal at the warehouse. The IWDS system was designed for multiprogramming; inquiries can be made through one terminal while data is being entered through another.

Present configuration of the systems includes three terminals in the Secaucus warehouse and two in the other four. The systems can be expanded to seven terminals each, and all could be operating simultaneously without changing either the processor or the programming.

The Westwood system is an NCR 8250 processor with 128K of memory. This additional capacity is necessary to handle the programming development work that will be performed there. With the exception of the Westwood warehouse, each warehouse's system includes the NCR 8230 processor with 80K of memory, 20M-byte disk capacity, terminals and a 125 line/min printer.

The distributed processing system is well controlled. Data is entered into the minicomputers throughout the day and reports are printed for the general managers as needed. Every morning, the host computer in Boston queries each warehouse's minicomputer over switched voice-grade lines and receives the previous day's transactions. Each warehouse will hold up to five days' transactions as backup in case of transmission difficulties.

All data is integrated into the host computer's data base, and consolidated reports for the entire company are prepared for Boston office management.

Three-Year Data Base

A three-year data base of sales information is also being built on the last computer and should be useful as a forecasting tool for manufacturing and inventory planning.

Future plans include a broader communications capability over the network. Today the communication flows from the local minicomputer to the host in Boston. With the additional minimal programming, the possibility of communicating from the host computer back to the minicomputers and between minicomputers will be available.

"We could create records for new parts, for example, and have the information available at the warehouses the next morning," McEvoy predicted. "Or we could process some data and then send it back and have it printed on the warehouse's printers. It is a very flexible system and one we expect to grow with for a minimum of five years without significant changes."

Weighing Pros, Cons of DDP

(Continued from Page S/35)

Users could also develop a centralized library of "skeleton applications using data base concepts," Docter recommended. This library would "carry structured programming to [its] logical conclusions," provide a base of "required management information and program code to maintain it" and allow "local installations to expand data elements and implement 'unique' code as desired."

In addition, the corporation could develop a data dictionary to be included in various applications during local development efforts.

Hybrid Style

The development of a hybrid management style, termed "business systems planning," "will apparently hold the key to the success or failure of the distributed data processing concept," the Price Waterhouse study suggested. "The concept combines the responsiveness of the 'bottom-up' approach with the control and structure of the 'top-down' approach."

Using business systems planning, the relationships between business processing, information and the organization are defined, the architecture of the systems is then designed to manage and report the data and the controls to assure integrity and consistency are developed.

Upper management delineates the structure, the objectives and the control processes to ensure the quality and consistency of information from the top down. Systems and information modules are constructed from the bottom up, allowing local management to set its own priorities, allocate its own resources, set time tables and allow local unique applications.

The report was prepared for the Hewlett-Packard Co.

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Urges Top-Level Guidance

Thesis Explores Motivations for Going to DDP

By Esther Surden
CW Staff

CAMBRIDGE, Mass. — Strong psychological, functional and economic forces are behind management decisions to decentralize DP operations, according to a recently published thesis entitled "An Analysis of Computer Decentralization."

Prepared by Cecilia R. d'Oliveira, a student in computer science and engineering at MIT, the thesis also noted that a drop in hardware costs allows decentralization to occur at the initiative of lower level managers.

The consequences of lower level managers making decentralization decisions could include "disintegration of the organization's information system," d'Oliveira who is now at MIT's Sloan School of Management, contends. "Decisions by lower level managers may overlook the technological constraints of decentralization, especially the problems of networking loosely coupled computers.

"This could result in a future inability to share data or programs among organizational units," she warned.

The report is based on her research of over 40 case studies and points out that top level management needs to guide the organization through the decentralization process.

The forces toward decentralization have been "held in check until recently by economic and technological constraints," the report noted. But economic constraints are "vanishing" as hardware costs come down.

According to the report, flexibility is the best word to describe the functional forces involved in choosing to decentralize. "Local control of operations gives the user the flexibility to regulate response time and time or availability, set priorities and schedule system upgrades. It also allows easy accessibility to the system."

Economic forces can be summed up in the argument over economy of scale. Supporters of large computers use Grosch's law — the power of a computer system increases with the square of the cost of the systems — to justify centralized systems. But in recent years, the economy-of-scale arguments have "been increasingly opposed," the report continued.

Part of the reason is high overhead found in most large systems resulting from multiprogramming and security support, the thesis continued.

Other arguments against the economy-of-scale position include "decentralized systems composed of uncomplex dedicated computers can be supported by fewer experts, thereby decreasing operating costs, and development time of a smaller (therefore less complex) function will be shorter and therefore more economic," d'Oliveira continued.

Other economic forces found to be significant in user decisions about decentralizing their operation include the low entry cost of installing a system and the low initial investment. According to the thesis, many organizations find it difficult to obtain the capital required to acquire mainframes.

Management may be hesitant to invest that much money in a system that will not be functioning for some time and will not accommodate step-by-step analysis to determine if the system will be effective.

Lower entry costs remove the economic constraints that once presented decentralization decisions and also enable these decisions to be made at lower managerial levels, the report noted.

Fixed Cost

The fixed cost of acquiring a mini system seems to be preferable to paying out variable service charges, the thesis continued. And installing a mini can lead to lower communications costs since not all data processed must be transferred back to the host. In many cases, the thesis pointed out, upgrading a mainframe for a new application is difficult to do and may cause interference problems.

"As hardware costs continue to drop and as technological advances allow sophisticated networking of computers, psychological forces may be the deciding factor in decentralization decisions," d'Oliveira conjectured. Possible psychological forces at work include bad experiences with a central system, the hope of greater user acceptance, fewer political and priority conflicts and conformance with the philosophy of the organization, the report noted.

Decentralization decisions can result from dissatisfaction with the existing large system. Communications barriers between the users and suppliers of DP expertise, long and frustrating waits for simple information or reports, development efforts so complex that "functions were often obsolete by the time they were developed," were pointed to by users as reasons they chose to decentralize.

Decentralized systems often ensure a greater degee of user acceptance because the system can be tailored to the user's needs. The user takes final responsibility and can be assured that DP performance is measured by how well his business is run.

(Continued on Page S/46)

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User Plays Mixed Doubles on In-House System

(Continued from Page S/3)

acceptable, 60 or below.

The system selected was HP's 3000 Series II under the MPE II operating system. The configuration is shown in the accompanying chart (on Page S/3).

Note the emphasis on reconfiguration flexibility via switches and HP's network software, Distributed Systems 3000 (DS 3000). A good name for this type of configuration, since it is located in one room, would be "decentralized, co-located."

The three HP 3000 systems shown in the diagram will replace a Univac 1050 and a Honeywell 2040 computer by the first quarter of 1980. There are a number of reasons why replacement is necessary, but lease expirations and the need to convert to on-line processing using minicomputers were key in that decision.

The feeling at Spalding is that this type of minicomputer-based, loosely coupled, multiprocessor configuration represents one of the ultimate facilities for central computing in a nonscientific environment. Its cost is relatively low, it is responsive, its throughput is high, it is flexible and it provides it own backup during periods of machine outage.

By taking advantage of DS 3000, such things as central technical support and central applications programming support to remote sites is operationally feasible. On-line reviews of screen masks and report layouts, for example, can be made between a user at a remote site and the central site programmer using a telephone and a terminal at each end.

Large batch job throughput beyond the capabilities of one machine can be accommodated. A job can be initiated in one machine, retrieve its data using another, do computations on another and print using another.

If one system fails, processing can be resumed with a number of reconfiguration alternatives. These and other possibilities within the configuration attack a recurring criticism of central computing facilities: lack of responsiveness by the management information system (MIS) development staff and processing interruption.

The applications planned for on the system include a complete set of information systems of the type typically found in a manufacturing environment with a distribution responsibility. Software packages will be employed for the materials planning, payroll and general ledger systems. The remaining systems do not lend themselves to packages and will be written in-house.

The materials planning system will be Comserv's Amaps/3000 from Far-West Data Systems, which contains modules for bill of material, materials control, materials planning, process and routings and standard costing.

Selection of the remaining packages is in progress. The various software development and implementation schedules will extend through 1979, and all systems will employ source data and varying degrees of on-line capability.

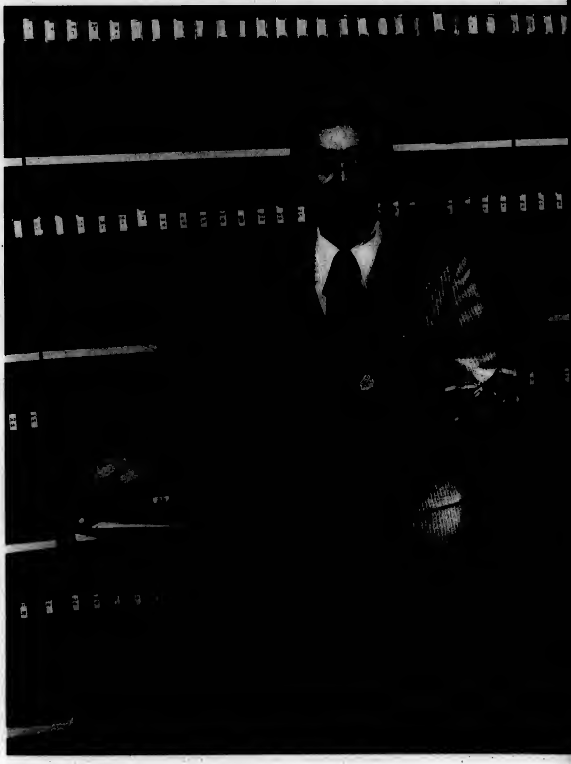
T/S Service Picked

A total of 152 CRTs, graphics terminals, printers and plotters will be attached to the configuration. Initially, CRTs and printers will be utilized on-line in eight warehouse and seven sales locations nationwide. Other locations outside the continental U.S. will be added later this year.

All long line communications will be provided at 300- or 1,200 bit/sec asynchronously, using the Tymnet network. The Tymnet service was chosen instead of developing an in-house network primarily because of its ease and speed of implementation, the low cost of high reliability, the range of coverage provided and its low operational impact on the Spalding staff.

Other data communications will be handled via leased line and Codex Corp. LSI 4800 modems. Locally, on-site data communications is direct connect via three-wire shielded cable (now successfully operating at distances up to 1,000 feet).

Mitchell is Spalding's director of MIS.



Motives Behind DDP Decision

(Continued from Page S/45)

"There seems to be a certain amount of power related to control of information in organizations," the thesis continued.

When other departments require the information DP provides, the other departments compete with each other for priority, the report explained. "Avoidance of the politics of the centralized data processing function" was mentioned in one of the report's case studies.

Centralized DP in a decentralized management environment can be "contradictory and dangerous," the report continued. "A decentralized management philosophy gives profit and loss responsibility to organizational units and provides unit managers with all the resources required to accomplish the task. To overlay a central DP facility on an organization of this sort may result in conflicts and confusion," the thesis said.

In some cases examined in the work, organizations opted for a distributed facility because it was "more in line" with the way management viewed the organization.

Using Measurement as Definition

DDP Can Be Seen as Spectrum of Possibilities

Special to CW

Distributed data processing (DDP) is one of those open-minded subjects that has been around for a long time and, as a result, everyone has had an opportunity to devise his own definition.

However, since measuring the impact of distributed processing has so much to do with its definition, it is impossible to escape one more definition attempt.

Let's assume for the moment that for any given computer system consisting of a CPU and remote sites of any type, the percent of distributed processing content ranges witin the following parameters:

- *Zero percent* — This describes an environment where all processing is performed in a central site. There is no telecommunications at any remote business locations to bring data to the central site for processing. Any transportation of data is via courier, mail, etc.
- *One hundred percent* — Here, all processing is performed in remote sites, each of which has its own computing system. There is no relevant central processor and no telecommunication ties exist.

With the above parameters established, let us now look at scenarios of various points within the above range:

- *Twenty-five percent* — At this level, relatively unintelligent or "dumb" terminals are tied to a CPU. This would be a situation, for example, with stock quotation systems or an insurance company that needs to inquire to a central base containing policy status data.
- *Fifty percent* — Here, important parts of applications are performed routinely at remote locations, but the CPU still maintains control over the entire processing environment. In this situation, key application parts might include data entry, remote printing or generation of reports using daily data. Summaries of transaction information could be performed at the remote site without access to the central computer.

Typical equipment at a remote site would be an intelligent terminal or a minicomputer/microcomputer that could be programmed independent of the mainframe. Insurance claims processing, not just inquiry, would be an example of this level. Another such situation would be a warehouse which, in addition to transactions reported to the corporation, would have large numbers of vendor deliveries and customer shipments to manage each day, detailed information on which would be required by local management but not at the central computer site.

- *Seventy-five percent* — At this level, full-scale computer systems of all types and sizes are set in remote locations and operate independently of the central site computer for local processing. These systems adhere to a minimum protocol for submitting key operational information to the CPU for overall corporate control. Otherwise, these systems are independent and serve local requirements. In addition, whole parts of a data base application may be shifted to the remote location.

No Specific Threshold

Thus, distributed processing can be viewed as a *range* of possibilities rather than a specific threshold that is crossed. At a minimum level (0%-5%) there is no processing through telecommunicationsat a remote site. In an extreme example (90%-95%) all processing has shifted to the remote site with no central processing at all.

The latter case is actually being implemented today at First National City Bank, where key applications that are separable from the mainstream of the bank's activities, such as trust management and securities handling, are being shifted completely out of the central computer to remote sites with no connection at all to the bank's existing large-scale central computer center operations.

Given this array of possible distributed processing environments, why is anyone interested in distributed processing, other than because it is the latest state-of-the-art computing environment being promoted by vendors?

The answer is simple: There has to be a good economic reason providing an acceptable return on investment. The kinds of payback from distributed processing might consist of one or more of the following:

- Labor Savings.
- Higher revenues because of faster turnaround of orders.
- Improved cash flow.
- Material cost savings and lower inventory investment.
- Improved reliability, such as the ability of a remote site to keep operating in a highly distributed environment even though the mainframe computer may be down.

This article is adapted from a report entitled "High Value Added Product Strategies — Potential and Pitfalls," published by Small Business Systems, 4320 Stevens Creek Blvd., Suite 230, San Jose, Calif. 95129. The firm specializes in market research reports in the small business system area.

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CW368

To Avoid Bottlenecks

DDP Should Be Seen as Evolutionary Process

By Ivan Socher
Special to CW

The distribution of DP power in networks, while relieving a large bottleneck at the mainframe, may lead to a number of small bottlenecks at remote sites, if Parkinson's Law and the Law of Diminishing Returns are to be believed.

For that reason, distributed data processing (DDP) should be viewed as an evolutionary process with continued delegation of functional authority that parallels in many respects the development of business organizations or political systems.

This evolution began before the 1950s when DP was characterized by manual operations and total decentralization. Businesses were smaller and the Washington bureaucracy was not yet in existence.

During the decade of the 1960s, the buzzwords became "economies of scale" and "centralized control." The benefits of centralization were warmly accepted by business and government, and computer technology tracked right along, in many ways accelerating the process of centralization.

But we forgot about Parkinson's Law: Work tends to expands to fill the time available. And we forgot about the Law of Diminishing Returns, which states we eventually will require more input to obtain a unit of output until the cost exceeds the benefit.

Thus, in the 1970s, users began to hear that bigness also means inflexibility, complexity and a declining marginal return on investment. In the EDP industry, monolithic centralized computer complexes had been established. In government, a monolithic centralized bureaucracy had been created. In business, there was a monolithic centralized head office. The point of diminishing returns had been reached.

First Move

The computer industry moved first by introducing remote batch terminals that relieved the CPU by allowing remote data capture. In government, more responsibility for such needs as health and environmental management was returned to local authorities. Businesses began to regionalize and divisionalize.

DP managers were again quick to realize that batch terminals were not enough, so the rapid diffusion of intelligent terminals occurred. Unfortunately, technology had not yet caught up with the movement in organizational structures, and the best the industry had to offer was data entry, minimal local job processing and limited local storage.

The technological challenge of the 1970s has been to create the systems that make it possible for information processing to catch up with political and business trends.

Today we have networks of distributed minicomputers that allow for multifunction, multiterminal systems, powerful local processing, pull-sized peripherals and concurrent operations.

But the most intriguing question today for users and vendors alike is: "Are we near to achieving an end or are we near to achieving a new beginning?"

If the laws that seem to govern people and organizations prevail, it is likely that network minicomputers will absorb more and more functions until their capacity is taxed to both technical and economic limits. It is interesting to note that as mainframe-oriented DP managers have come to accept the minicomputer as their own, their expectations for minicomputer performance is accelerating at a rapid rate.

Cost justifications, once the driving force in launching new DP projects, are inherent in the minicomputer, and the driving force has become technology.

For once in the evolution of data processing, the technology is available concurrently with the trend.

The innovation most likely to stimulate further distribution of processing is the microprocessor. Its implementation in a network will take many forms: It will help make dumb terminal intelligent; will permit development of programmable, intelligent controllers; and will be used as a front-end communications processor.

All of these utilizations have the same net effect — eliminating bottlenecks at the minicomputer CPU. Thus, we see distribution follow an iterative process that began at the mainframe:

- The intelligent terminal relieved the mainframe.
- The programmable controller relieved the mainframe.
- The minicomputer relieved the mainframe.
- The intelligent terminal will relieve the minicomputer.
- The programmable controller will relieve the minicomputer.
- The front-end microprocessor will relieve the minicomputer.

Process Begun

The iterative process has already begun. The complexities of network communications are beginning to be felt by the minicomputers. Many DP

(Continued on Page S/59)

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User Finds DDP Takes Up Slack in Control

(Continued from Page S/8)

planned and installed the MCS network. By using magnetic tapes, we can use the MCS without sacrificing the central financial control provided by our IBM mainframe.

The central HP 3000 system was recently upgraded from 128K bytes of memory to 512K bytes to enable handling more program simultaneously. The smaller HP 1000 systems each have 128K-byte memories for running smaller programs locally.

The central installation includes a dozen interactive CRT display terminals, two high-speed line printers and MPE-C multiprogramming executive software. Communications software provides remote access to files stored centrally with the HP 3000.

Farah programmers developed the manufacturing control software for the HP 3000 central system. Camsco, Inc. of Richardson, Texas, wrote the software for the satellites.

The MCS functions in cooperation with a complete order entry package implemented on our IBM 370/-158. There is no direct interconnection of the mainframe with the distributed network. There is insufficient need to continuously update the large system to justify the cost of software development and maintenance.

The 370 supplies order information via magnetic tapes for the HP 3000, and the 3000 handles actual cut order assignments. The 3000 transmits cut orders to the designated plants, depending on their workloads, fabric inventory, machinery, etc. Communication is by modem link through the HP network controller to the HP 1000 system in each plant.

Bills of Materials

All bills of materials are stored on disk at the central installation. A correct bill of materials is transmitted to a satellite along with the cut order assignment.

The satellites explode the bill of materials into "bundles," or smaller portions of the job. By fabric and size, the job is further broken down into individual parts necessary to make one size of a pair of slacks. A "bundle" includes every operation needed to make one part of that pair of slacks.

The satellites print out a stack of small 96-column punch cards for each "bundle," identifying the order and all required operations. These cards are put in zip-lock bags and accompany the cut order to the cutting room floor.

In the cutting room, employees called pattern makers, cutters, spreaders and shade markers take over.

Using Camsco Markamatic Systems, pattern makers lay out the optimum "fit" of pattern pieces on a layer of fabric. An X-Y plotter included with the Markamatic systems plots the arrangement full-scale on paper to form the pattern the cutters will follow.

Spreaders, meanwhile, have carefully stacked or "spread" piles of identical layers of fabric for the cut.

As the bundles of cut parts are separated, the punched cards accompany each bundle to the next work location.

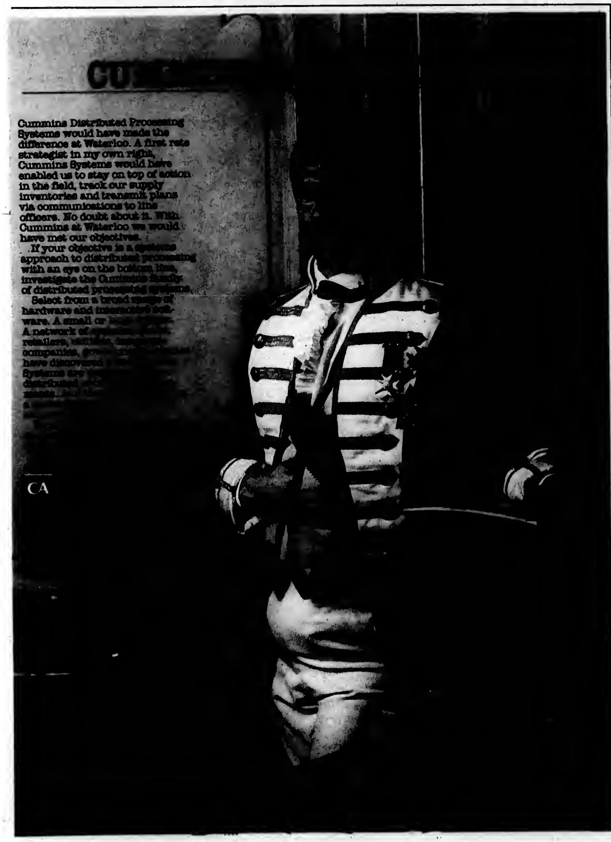
Once an operation at each new location has been completed, the operator removes an appropriate punched card, enters his or her operator number on it and places it in a pickup bin.

Punched cards are picked up daily and run through a card reader, which inputs the data on the plant's HP 1000. Production data stored at the satellite are transmitted daily to the 3000.

Daily reports are prepared to show every operation completed on every cut order in process. The central system also compares actual performance data with standard performance figures to determine if any adverse cost variances have developed requiring correction.

In addition, the 3000 prepares a summary production report which is logged onto magnetic tape for processing by the 370. The 370 uses the data in preparing larger corporate financial and management reports of which production reports are only part.

Bohannon is director of information services at Farah Manufacturing Co.


CU

Cummins Distributed Processing Systems would have made the difference at Waterloo. A first rate strategist in my own right, Cummins Systems would have enabled us to stay on top of action in the field, track our supply inventories and transmit plans via communications to line officers. No doubt about it. With Cummins at Waterloo we would have met our objectives.

If your objective is a systems approach to distributed processing with an eye on the bottom line, investigate the Cummins family of distributed processing systems.

Select from a broad range of hardware and interactive software. A small or [illegible] A network of [illegible] retailers, [illegible] companies, [illegible] have discovered [illegible] Systems are [illegible] distributed [illegible] ments. [illegible]

CA

A multiple choice quiz on Keybatch.

A multifunction data entry system from Data 100.

(WARNING: there may be more than one right answer to each question)

---

1. Keybatch is:

(a) a multifunction intelligent key-to-disk data entry system.

(b) a brand new multifunction system from Data 100.

(c) a multifunction system which supports high volume concurrent batch capabilities.

2. Keybatch is also:

(a) a multifunction system offering stand-alone RPG for expanded user flexibility.

(b) a multifunction system that can operate with on-line file inquiry capabilities (3271 compatible) via common keystations for both data entry and on-line file inquiry.

(c) a system capable of handling mail sorting and other office tasks.

3. As a data entry system:

(a) Keybatch has up to 20 megabyte disk storage capacity.

(b) Keybatch is proven with approximately 900 units now in use.

(c) Keybatch can be configured with 2 to 16 keystations.

4. For the end user:

(a) Keybatch meets short range goals such as appreciable dollar savings.

(b) Keybatch provides for long range system growth.

(c) Keybatch offers both of the above.

5. For more information on Keybatch, you should:

(a) search frantically through your EDP literature files.

(b) write Data 100 at 6110 Blue Circle Drive, Minnetonka, MN 55343.

(c) call your nearest Data 100 sales office or one of the numbers we've listed.

Are you a multifunction expert? Check these correct answers.

All answers but four are correct.

1b: Keybatch isn't brand new, was introduced in 1974.

2c: Sorry, Keybatch can't do everything.

3b: There are actually 1500 Keybatch systems on the job worldwide.

5a: No need to search when we're so easy to write or phone. Do it now.

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DDP Passing Its Entrance Tests, Survey Finds

(Continued from Page S/5)

current setup: *"Do you currently have distributed data bases or distributed processing within your network?"* The answers tabulated as follows:

Data base used only for editing and validation of data entry operation	5	13%
Data base available for local inquiry, update and processing	10	25%
No distributed data base	25	62%

The users polled reported a gamut of DDP applications, as noted in the accompanying chart. However, many of the "distributed" data bases were actually replications of portions of the master files kept at the host sites. According to some books, the existence of such redundant master files at host sites means the processing is not truly "distributed." Nevertheless, processing power is being taken to the source, generally on the strength of minicomputers.

Further, many of the data entry applications listed will add more substantial processing functions in the future.

This leads to the next question we asked our sample: *"Do you plan on having distributed data bases or distributed processing within your network in the future?"*

Here the answer looked like a vote of confidence on the results of current DDP experiments. The applications listed by respondents were less data entry and more data processing oriented as the chart notes. The hardware selections were more powerful, too, with IBM's 3790 getting a lot of attention.

Only one user now doing DDP said his company did not plan any future applications, and that was a qualified negative, brought about by the problem of keeping local and remote files in synchronization. The tabulation:

Have plans for specific applications	18	45%
Plan to have DDP, no specifics yet	11	27.5%
No plans for DDP	11	27.5%

Somewhat surprising — for someone who has read the press reports and heard competitors claim that IBM is "dogging it" in DDP — was interest in the giant's anomalous DDP solution, the 3790. We found 85 systems in place or on order at just five companies.

"We had a problem with service and finally trained one of our own people. He quit and we're back to Square One," one user said, voicing one of the worries that wrinkle the brows of DDP boosters: training. In fact, our survey showed that when it came to networking and DDP implementation, bottlenecks were about equally divided between "hard" and "soft" varieties. "Hard" problems resulted from equipment shortcomings, dealing with multiple vendors, not having enough capacity, software bugs, etc. The "soft" problems centered on such areas as training, management control, long-range planning and resistance to change.

Inextricably linked to DDP is data communications — a whole bunch of new headaches for DP managers wrestling with DDP implementation. In general, control of network growth did not seem particularly iron-fisted, and managers coped with costs on an item-by-item basis. But to help combat network growth, most companies were either following a master plan or devising one at the time.

Long-range (10-year) planning and technology forecasts were beginning to find their way into these plans. Most master plans for network implementation had multiple horizons, where the short-term plan (1-year) is very specific, the midterm plan less so, etc. Regardless of whether or not they had a master plan, most companies approved of network applications on a case-by-case basis at the corporate management level.

A picture emerges from the nature of the comments of the respondents and the numbers they offered. That picture shows:

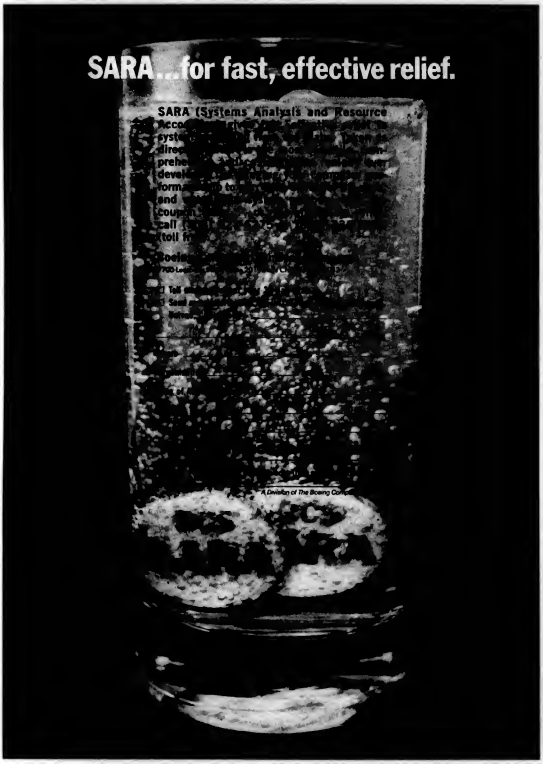
- DP and telecommunications managers grappling daily with the nitty gritty of network maintenance — and beginning to worry over the lack of time to plan adequately for the (fast-approaching) future.
- DDP — evolving through distributed data entry or preprocessing, with fully distributed data bases and summary files only at the host — still more envisioned than real.
- Network planning getting more formalized, meaning more long-range commitment from vendors, more high-level management involvement from users.
- Control, not hardware (or even software), becoming the real nut of DDP implementation.

It appears, then, that there is some fire behind all that DDP smoke, but implementation will be step-by-step.

One user gave this insight into why: "Our company is going through a major philosophical argument now, which will probably not be decided until year-end 1978. We lean now toward centralized system and network development. But we have a lot of minis out there in independent special applications, and even if we use only 10% to 20% of their capacity, they're cost-justified.

"People who have these minis at their sites want to put new applications on them to tap that excess — but without central control. This is a big issue," he said.

Gantz is the editor of International Data Corp.'s Distributed Processing Reporting Service *and Callahan is a freelance researcher/consultant.*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Compared With Centralized Design

DDP Architecture Gives Less Vulnerability

By Steven W. Oxman
Special to CW

Distributed data processing (DDP) is not a new concept in the DP arena. The peculiar requirements of weather information-gathering systems, utility control systems and airline reservation systems could not be met by centralized DP system designs.

These systems have the advantages of local control, low system impact in the event of a hardware failure and instant response time that DDP can provide.

In the past, DDP systems were very expensive because each computing location had more computing machinery than was necessary. In addition to cost, size and weight are sometimes important considerations. A multiprocessor system was usually larger and heavier than a centralized system.

Many departments within the U.S. government are performing studies to ascertain if the concept of DDP would better fit certain DP needs than conventional, centralized processing. The main impetus in these studies is exactly the same as that in similar studies undertaken by industry — the emergence of the minimally capable DP units, the minicomputer and the microcomputer. The cost, size and weight of these components make multiprocessor configurations feasible.

Target Application

Command and control is one computer application whose unique needs might be best met by DDP, regardless of whether it is for the operations of a submarine or a manufacturing plant. Operational inputs received by a command and control center are integrated with command objectives to produce real-time control outputs.

The most important aspect of a command and control system is that it must be operational when the process it is controlling is active. Since degraded operations are always better than a total system failure, lessening the system's failure vulnerability is always a forethought.

To distribute means to divide, to disperse in portions, to spread through a range. The traditional computing design for command and control has been centralized. Should central command and control computing systems be redesigned to distributed configurations? Will the distribution decrease system vulnerability? Will the distribution yield effective degraded modes of operation?

To answer these questions, a typical command and control system will be used as an illustrative example.

The loss of the central computer in the traditional command and control configuration usually meant total loss of the computing machinery. To decrease the vulnerability of the central computer, a modular computer design was developed.

The modular central computer typically included two or more CPUs, multiple I/O controllers (IOC), multiple power supplies and a set of independent memory modules, all interconnected on a backplane. As long as one CPU, one IOC, one power supply and a subset of the memory modules were operational, the central computer could continue to service the command and control functions, even if in a somewhat degraded fashion.

In addition to the central computer, our example will include CRT consoles, disk data storage, a master console and a complement of sensors and control devices connected to a data multiplexer.

If the data multiplexer had a digital processor incorporated within, it would be an intelligent device; the loss of the central computer would not then preclude sensor information being sent to control devices. The data multiplexer could decide which control devices could utilize sensor data that would not be filtered by the central computer.

Important historical sensor

(Continued on Page S/55)

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Knitter Finds Psychological, Financial Salvation

(Continued from Page S/9)

they provided the most cost effective approach.

In fact, Jordan said, Springs' knit division was able to cost justify installation of 340s not only at the Monroe and Mullins manufacturing facilities, but at corporate sales and marketing headquarters in New York City and at the customer service center as well.

First Installation

Though the 340s were primarily selected as replacement units for use at the two production facilities, the first 340 was installed at sales and marketing headquarters. Approximately 100 new orders and order revisions were being transacted there daily.

"In the past, all orders were hand-written, processed by a team of clerical personnel, then mailed to Lancaster for production scheduling purposes," Jordan noted. "Six to 10 working days would frequently elapse by the time the order reached its final destination. Since most of Springs' products are manufactured upon receipt of order, rather than for inventory, production scheduling timetables would also slip accordingly.

"With the Systems, we were able to enter orders on the same day they were received. CPU processing completed, production scheduling began immediately. As a result, delivery leadtimes on orders have been cut by at least one week," he explained.

Order status reporting presented another difficult-to-control situation under the old system.

"Customers or salesmen inquiring about the status of their orders would commonly have to wait for clerks at each of the plants to check out the necessary information," Jordan recalled. "Latest order status information is now transmitted nightly over telephone lines to New York and printed out on a 300 line/min printer, so the 22 salesmen in New York have current information every morning.

"Introduction of the system into customer service center operations streamlined transmission of shipping instruction to the Monroe and Mullins plants," Jordan continued. "Bills of lading keyed into the terminal before 1 p.m. are processed through the IBM 370 and transmitted to the appropriate plant for same-day order shipment. Orders covered by bills of lading received after the 1 p.m. deadline are shipped the following morning."

Upgrade in '76

So as not to tax the 340s beyond their capability, the knit division's DP management team decided to upgrade to Sycor 440s in the summer of 1976. The system had its own CPU; multiple CRTs; 64K of memory; 10M bytes of disk storage for handling files and inquiries; larger screens; and faster display response time.

The knit division now has a total of six systems in operation, one at the customer service center and New York marketing headquarters and two at each of the manufacturing facilities.

"One of the initial reasons behind system development and implementation," division controller Rowell said, "was to put rigid controls on production reporting and inventory control systems that were getting away from us. Decision-makers would come to planning meetings with different sets of numbers, and consequently, time would be wasted deciding whose figures were accurate. Now that all reports are standardized, business decisions can be made on fact."

"Physical inventories were conducted one weekend a month," Rowell added. "Despite the regularity with which inventory was taken, there would still be discrepancies between our records and actual stock.

"With the system, we have achieved a variance of less than .5%. And physical inventories are now conducted only once a year. Savings in this area obviously have been substantial."

At the two manufacturing operations, the systems and associated printers are used to receive knit tickets, dye orders, quality reports and bills of lading, and to enter information relative to raw materials received, knit tickets, greige goods (unfinished

(Continued on Page S/56)

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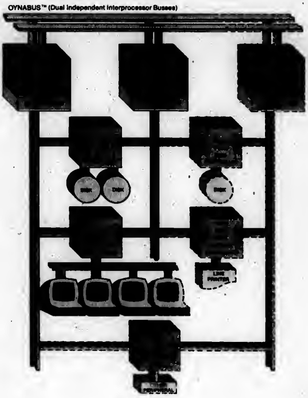

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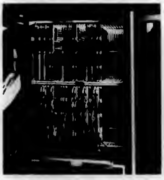

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With STARTBACKUP and CHECKPOINT. These are logical extensions of Tandem COBOL which implement the NonStop™ features of Guardian Multiple Processor Operating System. STARTBACKUP is called once at the

DDP Architecture Provides More Reliable System

(Continued from Page S/53)

data could be received, tagged and stored by the data multiplexer's processor. The sensor and control device data processing would now be hardware distributed, the work would be shared between the multiplexer processor and the central CPU.

The software would also be distributed; the multiplexer processor would house the local software functions for the sensors and control devices and constantly check the health of the central computer.

The central computer could have most sensor and control device software off-loaded, but would take on the new job of checking the multiplexer processor's health. The sensor and control device data would be duplexed to both the data multiplexer and the central computer, so if the multiplexer's processor had suffered a casualty, then the central computer would load the total sensor and control device software package and perform the necessary work.

If the central computer had a fatality, the multiplexer software would automatically switch the multiplexer processor into an independent mode.

When the data management functions are distributed from the central computer to a processor dedicated to a disk unit, the processor is commonly referred to as a back-end processor. The data storage and access algorithms and hardware-dependent algorithms are off-loaded from the central computer to the disk processor, with the central computer ready to perform the data management functions should the back-end processor fail.

The central computer's master console is normally used for bootstrap and diagnostic purposes. Since a failure of the master console does not affect a healthy operational system, the master console will not be altered.

The CRT consoles are the only man-machine interfaces. All command information will, at some time, arrive at one of these consoles, and all nonautomated control signals (operator actions) will originate from these consoles. The data bandwidth between the consoles and the computer is very high.

The console-dedicated software to support the consoles' high bandwidth, the graphics and efficient man-machine interfacing could be as much as 40% of the total system software. If the computer fails, the consoles are totally inoperable, so there is no such thing as degraded console operations.

The consoles would not be able to monitor the sensor-control device data transfers that would occur during the computer downtime. The CRTs would not be able to display historical data from the disk. To distribute console-related operations from the computer to the consoles is referred to as a front-end operation.

Front-End Suggestion

The front-end processor would provide an intelligent link between the operator consoles, the data multiplexer and the disk in the event of a total computer failure. Instead of building a new enclosure for the front-end processor, designing a new power supply and providing interconnections from the front-end processor to the consoles, embedding the front-end equipment into each console might be a better approach.

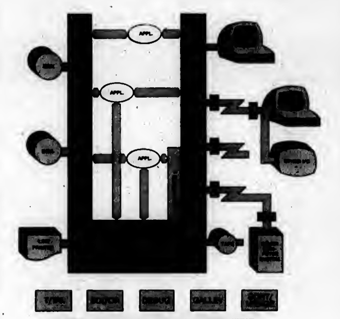
The final design consideration is that of system equipment interconnection. If the system equipment connects directly to a central computer and the central computer fails, all the processor capabilities now embedded in the system components are not usable. There are two alternatives to this design problem.

The first alternative is to redesign the I/O component of the computer to employ a passthrough architecture. The data arriving at any input port would be independently routed to all output ports as well as to the computer's memory or CPU. If the computer failed, the data would still pass through to the other system components.

The second alternative is to have all the system equipment connect to a nonhierarchical network. A star or radial network with a passive

(Continued on Page S/56)

standard about our COBOL.



The unique interaction between Tandem NonStop Hardware and Software makes the multiple processor system easy to use and easy to expand.

beginning of the program to set the NonStop mode. From then on, CHECKPOINT controls passing information to the backup process at critical points. CHECKPOINTS occur automatically at any OPEN or CLOSE after the backup is established. These two simple instructions eliminate the downtime, restart, and revalidation which plague any user without the Tandem NonStop capability.

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TANDEM

DDP Design Makes Less Vulnerable System

(Continued from Page S/55)

center node would have the least vulnerability. Data would be sent to the passive center node, which would "reflect" the data to all system components, including the originator.

The data would be sent to all components for many reasons. The most obvious is that a passive center node would not have the ability to know the point of origination or the desired destination.

Having the data echo to its origination point without extra software overhead is an efficient method of checking for data continuity. Providing the data to all system equipments allows the community to check the health of each system component.

When any data is sent, all members of the system community can check the data for validity. If the data is not valid, the member making that determination can verify that fact.

It is important to verify the decision with another member to be sure the problem is indeed with the originating member and not, in fact, an error of the determining member. By the time a total evaluation is made, all system members would know of the problem and its original and take the necessary steps to keep the rest of the system healthy.

This design tends to make the software less vulnerable to errors, and error detection is totally integrated within the system software. This design also provides constant checking of the health of all system equipment.

Even if one system device is not providing input to the system, it would be required to transmit system status information periodically. Any device not participating over a specified time interval would be considered faulty, and the remaining equipment would react accordingly.

In conclusion, the distributed architecture has the potential to produce a command and control system that could be less vulnerable to both equipment loss and software faults. In the event of hardware or software faults, automatic modes of degraded operations are inherent to this system design.

The areas of bus bandwidth, distribution of the data base and intrasystem processor reliability will have to be further investigated.

Oxman is a computer systems engineer with the Naval Underwater Systems Center in Newport, R.I. He is currently working on his master of science degree in computer science at Worcester (Mass.) Polytechnic Institute.

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Knitter Eases Operations

(Continued from Page S/54)

cloth) production, pulled greige pieces and finished inventory.

Special In-Plant Uses

The stand-alone processing capability and flexibility of the systems come in handy for other special in-plant applications as well.

At both Monroe and Mullins, for example, the systems are responsible for producing knitter earnings reports based on the performance of machines each knitter operates. At the heart of this system is a Computrol Corp. computer, which monitors operation of each of the 480 knitting machines in the two plants.

Normally, reports are printed via the Computrol printer after every shift. But with 15 separate reports being generated by the end of the work week, manually calculating knitter earnings became complex and time-consuming.

To improve accuracy of such reports, a Texas Instruments, Inc. cassette recorder was installed on top of the Computrol printer. Using a dial-up acoustic coupler, operational data stored on the cassettes is now batched in the morning at each plant to the Sycor which, using a special file, calculates each knitter's daily and accumulated weekly salaries.

A second report produced independently of the home office at each of the plants covers production of "seconds." Based on quality control lot inspections, the report tabulates how many pounds of second-grade fabric is attributable to knitting, dyeing or finishing operations.

Mini the Tool of the Future

DDP Genesis Owed to Electronics Revolution

By Robert Burns
Special to CW

In my opinion, the question of whether Distributed Data Processing (DDP) will be used or abandoned is really a question of technology. By technology, I do not mean programming technology or software sophistication — I mean technology of microelectronics.

With the development of the transistor 30 years ago, the potential of miniaturization was realized and a cause-and-effect relationship evolved between this component and new computer applications. This relationship was nurtured with the advent of Sputnik because the U.S. realized it was losing the space race.

An all-out effort began to develop sophisticated, complex electronics systems in which severe weight and power requirements were dictated. From this effort, the semiconductor integrated circuit was developed.

This happened in 1960. The advancements since then have been astonishing.

A single integrated circuit on a chip 1/4-in. square contains more electronic elements than the most complex piece of electronic equipment in 1950. Today's microcomputer, which costs a couple of hundred dollars, can outcompute Eniac, the first large scale computer, and is 20 times faster and thousands of times more reliable, operating as cheaply as an electric lightbulb. It is also available at hobby shops.

Now the most important fact of all: since 1959, the number of elements in the more sophisticated integrated circuit has been doubling every year. Today's circuits contain approximately 2^{18} (262,144) elements, and the trend seems to be continuing.

DDP is the deemphasis, if not the elimination, of one central processing location. The central DP operation began for two reasons: one, the cost of a computer was high when large companies were converting from manual systems to DP and, two, programming people were lacking. These two facts caused the central DP operation to remain the main configuration in most companies until five years ago.

Ideally, numerous smaller computers strategically located within a firm provide the firm with much more flexibility than one large mainframe. Individual groups within the firm can explore and develop within their own environment work in which they have a direct interest.

This promotes, to some degree, repetitions of things developed in other groups and perhaps, as Charles P. Lecht stated, it means distributed incompetence. But it also means a dedication to a project not found in today's central DP operation.

Job Market Boom

I feel this situation could result in very sophisticated programs approaching state-of-the-art development. It also will help develop more and better programmers — still one of the industry's major problems today. The young person looking for a career will now have the option of not only learning programming, but of being directly involved in other major facets of a corporation (i.e. accountant, engineer, lawyer, etc.).

DDP is definitely on its way to becoming the new DP configuration of the future because of this fact alone; new job market people will seek out the company that offers it.

In some companies in which I have worked, I saw individual groups developing highly sophisticated systems in which they were directly involved. The programmers who now work on complex management information systems are also, in many cases, the users.

There is a deemphasis of the typical programmer analyst going to a user department gathering facts, analyzing them, having meetings, gathering more facts, writing a proposal, having it approved, etc. Today we see the emergence of many small groups within a large corporation with their own minicomputers, discussing among themselves the development of a new system and simultaneously, if possible, doing the systems work and the programming effort.

Design specs are established, but there is a much less stringent adherence to them. Actually, that kind of "design freeze" was established by DP departments because changes affected their deadline with the user, a constant source of arguments. Now benchmarks will be established, but changes can occur without the usual problems.

Some companies are resisting the change because switching from centralized to distributed operations can be costly. However, I feel DDP can only benefit any firm in the long run.

The centralized aspect of DP will only remain as a management control area, monitoring each mini's expenses and output, which is necessary to keep costs down. But this will pose no major problem as most companies with large DP centers have this effort already established.

Burns is vice-president for development at Omni Software, Ltd. in Port Washington, N.Y.

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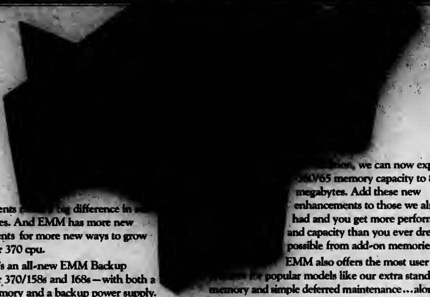

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Why Isn't Everyone Using DDP?

(Continued from Page S/33)

encryption devices to protect data communications and personnel identification schemes via voice prints, signature verification, etc.

Data Integrity

With the distribution of processing and, presumably, the data base, we are faced with assuring data completeness and accuracy. To assure data integrity, the system control procedures must be precisely defined and system monitoring must be tight.

Each user department cannot be left to its own procedures. Management must oversee the network, and that is a full-time function. Unfortunately, few people are trained or experienced in such activities — and that is very scary.

What happens when a failure occurs at a remote site? While you are waiting for the serviceman, are there alternative ways to process data and access the data base?

Whereas a central site can provide backup by a duplexing agreement with another user or with a local service bureau, the ability to provide equal capability at remote sites can be complex. Backup capabilities for each site must be examined.

Service and Support

It is no longer sufficient to have a technically sound product with a service capability in your single location. The manufacturer must be able to provide consistently sound support and service at all present and future remote locations.

While headquarters may be in a major city, remote computer sites may well be in suburban and rural areas. Service is so critical that it overrides performance as the highest priority.

Until the user faces these issues and solves them properly, DDP systems will not be widely employed. For that reason, DP users must educate themselves as to the intricacies of distributed processing and how it can meet one's specific needs.

Feidelman is president of Management Information Corp. in Cherry Hill, N.J., publishers of data processing system evaluation reports. This article was extracted from the February issue of Datacom and Distributed Processing Report.

Terminals, DDP Go Together

(Continued from Page S/39)

only to authorized users, whether remote or local.

It is important to remember, though, that the more processing responsibility given to the local terminal, the better. Remote communication is time-consuming and costly because it necessitates phone-line use and requires the involvement of a host/processor, which adds overhead to the host.

Of all the tasks and functions associated with terminals used in distributed networks, source data entry ranks as the most critical, because any inefficiencies incurred at the source of the data will cause far greater inefficiencies — and waste more money — as they move through the system.

With user-programmable terminals, it is possible to edit the data *as it is entered*, by creating error-free screen formats that guide the operator while he enters the source data. This carries the added benefit of letting the person in charge of the local application contribute to the screen-format programming during format creation.

The real key to the processing potential of a network terminal is its software, since it is needed to keep up with the fast pace of hardware development. An intelligent terminal product may have the hardware to provide user-programmable screen formatting, but does it have a screen-formatting utility that runs under its high-level programming language?

Does it have a data entry utility? Can the operating system automatically allocate system resources when used in multitasking mode? Do utilities exist for creating data base files with multiple index keys?

The maturity of an intelligent terminal lies not so much in the hardware but in the software, which must provide means of exploiting the power inherent in the hardware.

Similarly, communications hardware is relatively simple to evaluate and use, but software is less tangible. Communications software interfaces used with an intelligent terminal should be efficiently written, mature and field-proven.

Furthermore, the terminal-product vendor should show a strong commitment to comprehensive development and testing of new software, because the surface of distributed processing is just now being scratched; its full potential will only be uncovered by software that has yet to be written.

As DDP evolves and matures, more and more minicomputer and microcomputer-based intelligent terminals will find their way into increasingly sophisticated terminal applications. It is vitally important, therefore, for the system designer to consider the future of a given distributed system when evaluating terminal processors that are being selected for limited use.

Budgetary considerations dictate that terminals be purchased with sufficient hardware and software features to do the job(s) at hand, but these same terminals must contain provisions for future enhancements and system expansion, since the primary virtue of any distributed network is its inherent capacity for orderly system growth.

Sharpe is PTS-1200 marketing manager at Raytheon Data Systems Co., Norwood, Mass.

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Users Must See DDP as Evolutionary Process

(Continued from Page S/49)

network managers long oriented to the large mainframe expect the minicomputer to behave like a little IBM 370, and one of the immediate problems of minicomputer vendors is the slow-moving transition to Systems Network Architecture (SNA).

Three or four and possibly more communication protocols must be absorbed, and the protocols are getting more complex as they become embedded in data management, i.e. SNA/-Synchronous Data Link Control (SDLC).

One approach for a system based on minicomputer central processing would be to decrease the total load on the central processor by distributing intelligence to programmable control units.

These control units, each of which contain a microprocessor, can be used as front-end communications processors (for bisynchronous, asynchronous, and SDLC communications), as intelligent controllers for peripheral units and so on.

The microprocessor controllers, which contain their own dedicated memories, are loaded dynamically from the central processor, thus giving each unit the inherent flexibility to adapt to future possible changes.

In all of these examples, it is intelligence that is being distributed. The distribution itself is invisible to the user. Future advances in network architecture will lead to a "virtual terminal" concept:

- Multicommunications between all elements of DP will occur without the operator or user knowing or caring where the actual computer power or data resides.
- Multilinks will exist.
- Corporate networks will become transparent and unified to allow for the interaction of all elements in the system.

This continuing evolution will see the elimination of the mystique that surrounds DP. Users will perceive the terminal as just another tool integrated into the organization and management of a business.

Is this prognosis for DP consistent with trends in business, government and society?

We all know that one of the great challenges of top management in this decade is the search for ways to make work more satisfying and meaningful to the individual while still fulfilling the purpose of the enterprise. The trend is to create ever smaller pockets of dedicated activity in which small groups have identifiable and measurable objectives which contribute to larger goals.

The real job of management is to eliminate bottlenecks that occur when the groups and/or their activities must interact.

Realm of Individuals

Society has proven it can survive as a whole despite major internal and external crises, but yet when it comes down to individual life styles, people identify with one or more special interest groups. Usually individuals structure their lives in those groups according to size and personal involvement into a hierarchy of affiliations.

As for the political system, in some respects the society is highly governed, but in others it is loosely governed. A paradox?

No. The pervasiveness of government lies in its multilayered structure. The country is guided by rules dictated by the federal government, state governments, county governments, city governments and, in some cases, residential community governments.

Most of the rules are culturally assimilated, and as long as the rules are consistent and not overly oppressive, often individuals do not know or care which of the governments instituted the rules.

The similarities between the evolution of DP and the evolution of our social, political and business systems are not coincidental. The question is: Can we predict the future of DDP based on these larger trends?

It is easy to forecast further distribution over the near term because it is already happening. Centralization and decentralization are relative concepts. If decentralization of a headquarters computer center leads to a number of scattered small computer centers that become centralized bottlenecks, it is questionable whether or not decentralization has been achieved.

But is there a limit to DDP? Is decentralization a swinging pendulum that, once an extreme is reached, will start swinging back to the opposite extreme?

The user of a "virtual terminal" that is linked to all elements of the system could care less whether the data or computer is centralized or not. The truth is that vendors cannot, using existing technology, economically supply a system with everything centralized.

DDP is a solution that is contingent upon available resources of the present and foreseeable future. If the pendulum is to swing back, the change will be predicated on a reversal of current social trends and technical breakthroughs. Such events are measured in generations, not years or decades.

Ivan Socher is general manager of the Commercial Systems Division of Computer Automation, Inc., Irvine, Calif. The firm is following the off-loading approach outlined in this article.

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TEXAS INSTRUMENTS.

Modcomp Systems Offer Cobol, 'Total' On 32-Bit Machine

NEW YORK — Designed primarily for measurement and control, communication and scientific applications, the Classic Series 7860, recently introduced by Modular Computer Systems, Inc. offers users Cobol and Total data base management capabilities usually associated with business applications.

Although the Classic systems have a different internal architecture from that of their predecessors, they are said to be program and I/O compatible with the Modcomp II and IV systems. The 32-bit minis run under the established MAX IV operating system.

The systems can be compared to the Digital Equipment Corp. PDP-11/60, Systems Engineering Laboratories 32-bit machines and the Data General Corp. Eclipse, a spokesman said.

An integral high-speed floating point processor that performs operations on 32-bit, 48-bit and 64-bit operands in parallel, an enhanced Fortran compiler and software for industrial applications were also announced.

The Classic systems accommodates up to 512K bytes of memory, either core or error-correcting MOS, or a combination of the two. The memory is either two- or four-way interleaved, producing an effective cycle time as low as 150 nsec, the vendor claimed. With MOS memory, users can choose to configure their systems without error correction.

Five concurrent memory access paths on the system provide simultaneous CPU and I/O access capability. The CPU uses two paths — one as an instruction pipeline and a second as an operand pipeline. The rest of the paths are taken up by the I/O processors, optional communications processors or by extenal users. Access paths can be prioritized by the user in certain applications, the firm pointed out.

Memory Protection

Two forms of memory protection are available on the minicomputer. The memory protect implemented in the Memory Management System consists of a four-level protect code assignable to each 512-byte page. A second protect capability is used with extended memory addressing. An upper and lower boundary is established, and accesses outside these boundaries generate a protect violation, the firm said.

Memory is addressed by con-

(Continued on Page 46)

Modcomp Classic 7860 System

Traveling to trade shows and malls, minicomputer-based systems like this one are providing people with posters and T-shirts with their pictures on them. See story on Page 46.

Familiarity Breeds Success, User Finds

By Esther Surden
CW Staff

PORT WASHINGTON, N.Y. — A knowledgeable user is the key to running a successful small business system. That's the opinion of Cornell Jaray, president of Kennikat Press, owner of a Digital Equipment Corp, Datasystem 340.

"When you have a small company (DP) problems will continually crop up," he stated. "Ninety percent of these involve going over to the machine, looking at it, analyzing the difficulty and pushing a few buttons. But you've got to know what you're doing," he pointed out.

Jaray chose his small system based on service criteria, he explained. "We ruled out almost all of the smaller companies; the most important element was ready availability of service." Next in importance was suitability of the system for the operation, he said.

Narrowing down the field to IBM and Digital Equipment Corp., Jaray "leaned toward IBM" until he found out that "75% of IBM small systems users had in-house DP managers" — something he didn't want to have. So the DEC system was chosen.

However, Jaray has really had to become his own in-house DP manager anyway, he pointed out. He's learned to find minor bugs and make minor modifications.

After he decided on DEC, Jaray received a postcard from an OEM soliciting business. After talking to the salesman, he placed an order with him. The OEM sent candidates for doing the programming.

The first person "was totally ignorant of accounting functions," so although he knew the DEC machine, the publisher did not use him. The next person the OEM sent him to interview was David Gale, then a freelancer and now president of Mini Computer Business Applications, Inc. (MCBA) a Los Angeles-based turnkey firm.

Gale knew the machine and was aware of the problems facing businesses, Jaray pointed out, and he began working to get the machine operational by Jan. 1.

Directly to DEC

A bit later, the OEM called and said he couldn't get the discount he expected on the system so the system was going to cost the publisher more money. Since this didn't seem right to Jaray, he went directly to DEC, explained his predicament and proceeded to buy a DEC system. Gale remained on as the system's programmer, doing all the programming in Boston and delivering the software to Port Washington on disk packs, Jaray noted.

So that the system would be up and running by Jan. 1, Jaray and

(Continued on Page 46)

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Firm Builds Traveling Portrait Trade on Mini

By Ann Dooley
CW Staff

TORRINGTON, Conn. — Computer Artists, a traveling computer portrait company headquartered here, uses a minicomputer to reproduce faces on T-shirts, pillowcases, calendars and puzzles.

The process takes less than a minute, according to Michael Kramer, operator of the system, who said the computerized portrait appeals to people of all ages, "from little kids to grandparents."

Kramer uses a Digital Equipment Corp. PDP-8A minicomputer, a Centronics Data Computer Corp. Model 102AL printer, a closed-circuit TV camera, two TV monitors, two zoom lenses, a close-up lens, a heat transfer machine for imprinting the picture, lighting and cabling, computer paper, three ribbons for portrait and transfer use and other accessories.

The TV camera transmits the subject's image to the mini. Then, the 102AL, operating at 125 line/min, uses 12,000 numbers, letters and symbols to produce the portrait, Kramer explained.

The whole unit costs approximately $15,000 from Computer Games, Inc.

After a few days of training on the system, Kramer began taking his business to trade shows, shopping malls and other "well traveled" locations from Florida to New York.

"Beach locations often prove to be the best," Kramer noted.

He is planning to upgrade to a PDP-11 and add another Centronics 102AL printer so that he can print out horiscopes, biorythms, lettering and reverse images.

The cost for the system will be $28,000.

Since Kramer travels to so many different locations, good service and equipment is essential to him. But he has had no problems with breakdowns so far and is extremely happy with the system, he commented.

Modcomp Has 32-Bit Series

(Continued from Page 45)

verting the 16-bit virtual address defined by the instruction into a 21-bit physical address, the spokesman explained. The 21 bits allow the system to address up to 4M bytes of memory, and any one of nine addressing modes can be used.

With extended addressing, users can directly address any word in physical memory. This scheme works with most indexed and short-indexed instructions, the firm said.

The I/O processor for the system is available in two versions. Users can get a single plug-in board with one I/O bus or another plug-in board with two I/O buses. A system may have up to four I/O buses depending on the model selected, the firm said.

The I/O structure includes a "party-line" bus that can accommodate up to 63 peripheral devices. The mini has 16 priority interrupt levels, two of which are I/O levels that can be connected to 64 sublevels used by device controllers and external users, the company explained.

The Cobol used on the Modcomp system is "a low intermediate implementation of the Ansi standard X3.23 1974," the firm said. It will run on the Modcomp II, III and IV as well as Classic. The language requires a CPU with 256K bytes of memory, at least 5M bytes of moving head disk capability and a console device, the Modcomp said, and it costs $7,500.

The system uses Total from Cincom Systems, Inc. for data base management. It operates under both the Max III or IV operating systems and costs $10,000.

Maxine — the Modular Application Executive for Industrial Engineering — is designed to reduce the amount of time an industrial control engineer must spend developing a control system, Modcomp said. It will run in CPUs having only 32K bytes of memory and costs $5,000, the firm reported.

A basic Classic system with 64K bytes of memory costs $58,000. Modcomp is at 1650 West McNab Road, Ft. Lauderdale, Fla. 33309.

Familiarity Breeds Success

(Continued from Page 45)

his wife and staff spent Christmas week working day and night to input 2,000 titles and 4,000 customers.

Using the previous system, all invoicing and billing were done by hand with an outside service taking three weeks after month end to produce gross sales reports. Now the publisher gets more detailed sales reports half a day after the month closes.

When the sysem was first installed, it met some objections from the firm's order clerk, Jaray indicated. "Our invoices used to come out letter perfect manually, but with the computer, our invoices came out in shambles."

It turned out that the clerk had been redoing the invoices each time she made a mistake — even if it meant retyping several pages. With the system, she could no longer fall back on her old method of retyping and would resort to pushing buttons.

After investigating why the invoices were coming out with so many problems, Jaray had the system programmed so that when it started up, a message flashed on the screen saying "Norma, please don't push my buttons today." This improved the situation enormously, he stated.

Every system will have problems with bugs, Jaray said, but he feels most of the bugs are out of his software now.

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- QM-1 customers have emulated commercial, militarized, avionic and special purpose computers. They range from micros to fourth generation Large Scale General Purpose Systems.
- Users are not limited to one system identity; they can emulate as many kinds of computers as they like, even run multiple emulations of different systems concurrently.
- The QM-1 allows you to contol and monitor the emulated system, even primitives like gates, data busses and registers. You can use it to design new computers.

Here's what QM-1 users have found to be true:

- Emulators on the QM-1 are running one hundred times faster than simulators on more expensive systems.
- The QM-1 is an easily modified, reusable breadboard to verify and validate device design.
- The QM-1 is without equal as a software development tool for any computer. It will also protect investments in software running on destandardized machines.
- The QM-1 is an excellent design tool for analyzing software structure, system composition and hardware/software trade offs.
- The QM-1 is ideal in a computer science environment for instruction and research into hardware and software architecture.

Prices range from $190K for a minimum system configuration, capable of running Nanodata supplied software, to upwards of $700K for a multiprocessor. A "typical" customer configuration sells for $280K and includes emulators of the PDP 11, Data General NOVA, IBM 360, etc.

Do you qualify as a prospective user? If you do, then write for additional information or, better still, call Michael Senft, Director of Marketing.

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Small System Suits Various Uses

MILPITAS, Calif. — The Xycon III system from Computer Systems Unlimited is designed for professional, educational and industrial/-scientific uses, according to the vendor.

Built around an Intel Corp. 8085 processor board, the system includes a CRT and controller with character intensification, blinking underscoring and reverse video on a character-by-character basis, a 63-key typewriter-style keyboard with a 16-key numeric and cursor cluster, 32K bytes of random-access memory (expandable to 64K bytes) and dual floppy disks.

The system can support the use of high-resolution graphics or special and scientific or foreign alphabets, the vendor pointed out. Using an intelligent controller for the disk drives allows the system to control two dual-sided disks for 1M byte of auxiliary storage.

A system with 32K of memory, keyboard, numeric and cursor control pad, 2K-byte system monitor in read-only memory, two 500K floppy disk drives, CRT and operating software costs $9,220, the firm said. Computer Systems Unlimited can be reached through P.O. Box 870, Milpitas, Calif. 95035.

Xycon III System

IBM 5100s Get Keypunch Link

PHILADELPHIA — A device to interface the IBM 5100 desktop computer and the Series/1 to both the IBM 129 keypunch and IBM 029 keypunch is available from Community Computer Corp.

The CCC 1700A keypunch interface receives bit serial data from the IBM 5100, converts it to Hollerith and transmits it to the keypunch for data card punching, the firm explained.

880-Char. Buffer

An 880-char. buffer allows data rates to exceed the punch rate of the keypunch, it reported. Standard transmission rates from 75 bit/sec to 9,600 bit/sec can be accommodated.

When connected to the IBM 129 and functioning as a card reader, the 1700A is capable of reading a deck of data cards continuously at 55 card/min.

The CCC 1700A keypunch interface costs $2,850 from Community Computer Corp., 185 W. School House Lane, Philadelphia, Pa. 19144.

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TEXAS INSTRUMENTS.

Buys Unit With Custom Software

Firm Gains DP Without Changing Operations

By Tim Scannell
CW Staff

SANTA CLARA, Calif. — When officials of RYT Industries here began searching for a small business system, they wanted one that wouldn't require them to change their operations.

The manufacturer of custom microwave products examined several systems offering "canned" software, but discovered most of them would require a "change of air methods to adapt to theirs," Ken Yamaguchi, RYT vice-president, recalled.

RYT decided to purchase a Diablo 3200 computer, manufactured by Shasta General Systems, "both for the price and the custom software that was included," Yamaguchi said.

The system is used at RYT mainly for inventory control and material planning. The inventory file, stored on diskette, contains the part number, description, costs, quantity on hand and vendor as well as quantity on order, committed and used for the year-to-date.

A model file is also maintained that consists of the model and part numbers and the quantities required to assemble the finished product.

Anywhere from 20 to 99 parts are required to produce a particular model of a filter, amplifier or isolator, Yamaguchi explained. A perpetual inventory of these parts, 3000 in all, is maintained by the Diablo 3200.

The system at RYT is based on an Intel Corp. 8080 microcomputer with 24K bytes of random-access memory. It also contains a dual-diskette drive with a 3M-character storage capacity, a 1,920-character CRT and a 200 char./sec matrix printer.

Supports Bid Process

The CRT workstation for the 3200 is used for on-line parts explosion and enables RYT to produce up-to-date bids for its customers, Yamaguchi said.

When RYT puts together a bid proposal, the operator keys the model number and quantity required and the system lists, by part, the quantity required, cost information, on-hand balance, quantity committed and the quantity needed to meet customer demands. RYT management is able to make engineering, production and marketing decisions based on this information, Yamaguchi said.

Material usage is monitored through a stock requisition report that is generated daily by the system.

Parts are costed to the job simultaneously on a first-in/first-out (Fifo) basis, reflecting the actual experienced cost. Fifo costing was awkward for RYT under the previous manual system because frequent purchases were made at different prices and parts from several purchases were on hand.

The system is now used successfully because the materials can now be identified as belonging to a specific job, Yamaguchi noted.

As materials are costed to a job, quantities committed are reduced, on-hand balances are diminished and quantities used in the year-to-date are updated, he said. "By reducing the number of overstocked parts and obtaining better pricing on frequently used parts, we have reduced inventory expenses," he pointed out.

Prior to the installation of the Diablo 3200, all records at RYT were kept manually. But "the complexity of our operation, coupled with the growth we are experiencing, dictated the need for an automated system," he stated.

The system, operational since October, is expected to handle such things as accounts payable, accounts receivable, payroll and general ledger.

SBC-80 Users Get Tape System

WALTHAM, Mass. — Computer Marketing, Inc, is offering a 1/2-in. magnetic tape system for users of Intel Corp.'s SBC-80 microcomputer.

The industry-standard System MT 80 is hardware- and software-compatible with Intel's SBC 80 microcomputer and its Microcomputer Development System, the vendor said.

The system is made up of one to eight tape drives and a single SBC-80 Multibus interface card. Formatters are an integral part of the tape drive and allow for NRZI, PE or dual-density operation on 7- or 9-track tape, according to a spokesman.

The program need only set up the MT 80 control register and all subsequent data transfers to and from tape are performed automatically, he said.

The interface card, contains a dual memory mapped DMA buffer and up to 8K bytes of static random-access memory which can be used for tape buffering or system memory. Software drivers are available for Intel's Real-Time Multitasking Executive RMX-80 and Isis II operating systems.

An MT 80 with 9-track, 800 bit/in. NRZI operation costs $4,700, for the 7-in. drive and $5,525 for the 10-1/2 in. drive The price includes the tape drive, formatter, 512 bytes of static RAM documentation and a 5-ft cable.

Computer Marketing is at 257 Crescent St., Waltham, Mass. 02154.

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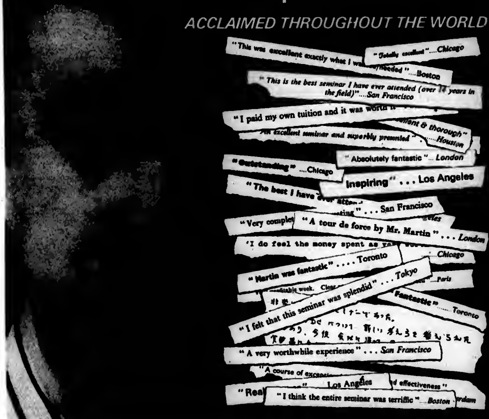
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Driven by Intel 8048

Axiom Unveils Two Electrostatic Printers

GLENDALE, Calif. — Axiom Corp. has unveiled two electrosensitive printers, each driven by an Intel Corp. 8048 microprocessor and compatible with RS-232C and 20mA serial input as well as parallel Ascii interfaces.

The Model EX-801 operates at speeds up to 160 char./sec and offers a choice of three character sizes to provide 80, 40 or 20 columns on the 5-in.-wide electrosensitive paper, according to a spokesman. The unit features a 256-character multiline asynchronous input buffer expandable to 2K characters and 96 Ascii standard characters that can be increased with programmable fonts, he noted.

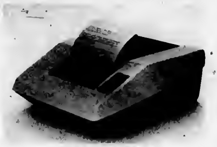
Available as an option is 2K bytes of user-programmable read-only memory (Prom) that allows the user to call on subroutine blocks in the software package stored in the 8048 controller, Axiom said. Input data can be formatted to user specifications, it claimed.

The unit also has a reverse printing capability so light characters can be formed on a dark background, the spokesman said.

The EX-820 printer is similar to the 801 except that it has the ability to mix alphanumerics and graphics on each line. The user can define the size of each graphics field and choose from four preprogrammed horizontal dot resolutions up to 128 dot/in., Axiom said.

Vertical dot resolution is fixed at 65 dot/in; there is also a provision for automatic histogram generation, according to the firm. A 512-character serial input buffer expandable to 2K characters is standard.

Printout for both units is produced by passing a high current from the eight tungsten wires in the printhead to the conducting surface of the aluminized paper. The aluminum is removed by the current which lasts a few microseconds and exposes a layer of black ink which is seen as a dot matrix, forming the printout, the spokesman explained.



EX-801 Microprinter

Both printers include a power supply, character generator, low paper detector and built-in self tester. The Ex-801 is priced at $655 in single quantities and $450 OEM; the EX-820 sells for $795 individually and $555 in quantities of 100.

Axiom is at 5932 San Fernando Road, Glendale, Calif. 91202.

16-Bit Board Has Variety of Options

IRVINE, Calif. — A 16-bit microprocessor board set compatible with the S-100 bus plus a variety of options have been announced by Alpha Microsystems.

The AM-100 microprocessor board set replaces 8-bit-based processors and offers multitasking, multiuser time-sharing in an advanced disk operating system environment, the firm stated. Utilizing a Western Digital Corp. WD-16 microprocessor, the unit reportedly provides 16-bit capabilities with 11-digit floating-point arithmetic and an on-board real-time clock.

The board contains the Alpha Microsystems Operating System (Amos), which allows device independence and provides disk file management, a multistructured file system and a multipass macro assembler with linking loader, according to a spokesman. The memory can be expanded to more than 256K bytes in partitions of up to 64K bytes via the memory management sysem included in Amos, he noted.

Peripherals such as static memory, memory paging and I/O facilities are also supported by the unit, the spokesman said.

Disk Controller

Also introduced was the AM-200 direct memory access (DMA) soft-sectored floppy disk controller, designed to support the AM-100. The controller allows user formatting of floppy disks and provides multiple drive control and multilevel interrupts.

The unit will control up to 16 floppy surfaces and provide full or partial sector reading, the spokesman said. It supports either IBM 3740 diskette format (256K byte/drive surface) or the firm's AMS format, which allows 315K byte/drive surface. The CP/M disk operating system is implemented as an option, the firm said.

Another option, the AM-300, is a six-port serial I/O unit that provides fully programmable RS-232C ports with 16 transmission rates up to 19.2 kbit/sec. The unit is based on Western Digital's Astro chips (UC-1671B) and will accept data in either asynchronous or synchronous modes.

The AM-400 is a disk subsystem that supplies the user with 50M bytes to 2.4 G bytes of on-line storage, the firm said. The unit is capable of supporting up to eight California Computer Products, Inc. Trident disk drives with an average access time of 28 msec.

The AM-400 includes two disk drives with 225M bytes of storage controllers, and hardware as well as documentation.

Prices for the AM-100, AM-200, AM-300 and AM-400 are $1,495, $695, $695 and $20,355, respectively, from Alpha Microsystems, Suite N, 17875 Sky Park North, Irvine, Calif. 92714.

'NLOS/1' Handles English Phrases

NAZARETH, Pa.. — A phrase-oriented programming language that operates on both 8080 and Z80 microprocessors with a minimum of 12K bytes of random-access memory (RAM) has been released by Cybermate.

The Natural language Operating System (NLOS/1) breaks information from sentences into phrases that are classified both grammatically and by the type of data they convey, a spokesman explained. A dictionary of phrases is maintained within the RAM.

Grammatical forms recognized by the system are "subject" for nouns and pronouns; "links" for verbs; "prepositions" for prepositional phrases; and "modifiers" for adjectives and adverbs, the spokesman stated.

Associated subjects and classified sentences are stored in a section of the dictionary and can be retrieved by inserting one of six reserved words.

Other commands include "clear," which initializes the RAM dictionary; "save," which saves the dictionary on cassette tape; and "load," which restores the dictionary from the tape input, the firm said.

NLOS/1 is available with a fully documented set of Assembly language source listings for $200 per program copy from the firm at R.D. No. 3, Box 192A, Nazareth, Pa. 18064.

Drive Takes Files Of Various Sizes

LAKEWOOD, Colo. — A tape drive subsystem that records variable-length blocks on standard cassette tapes and is compatible with the S-100 bus is being offered by General Micro-Systems.

The SYS I records biphase Manchester code at 1,600 bit/in. on Ansi standard data cassettes with a transfer rate of 2,000 char./-sec at 10 in./sec, a spokesman said.

Because recording is in variable-length mode, a 10K-byte record, for example, can be followed by a 32K-byte record, the spokesman explained. The user program may load the next record, operating as a batch data processing system, with an unlimited amount of data.

Using large records, more than 700K bytes can be recorded on one side of a standard cassette, the firm noted.

Rewind time is less than 30 sec at more than 120 in/sec, the firm said. By counting interblock gaps, a record can be located in less than 15 sec, the spokesman claimed.

The single-drive unit is priced at $595 and the dual-drive unit $969, with the S-100 interface board costing $168 from the firm at 12369 W. Alabama Place, Lakewood, Colo. 80228.

Book Details MPU Interfacing

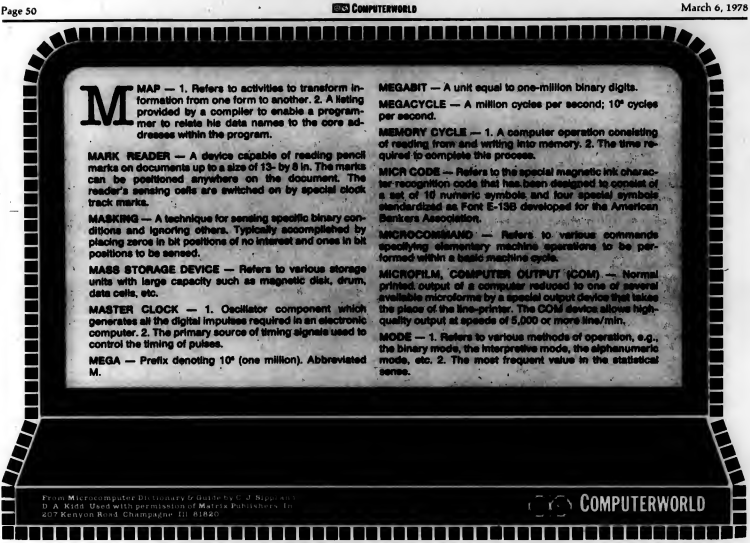
BERKELEY, Calif. — Sybex, Inc. has published a book that details the assembly and operations of a microprocessing system from the various buses involved to the assembly of the MPU.

Microprocessor Interfacing Techniques, written by Rodnay Zaks and Austin Lesea, is aimed at those who have a basic understanding of microprocessor operations. The book, which focuses on interfacing in general, attempts to instruct the reader on how to link a complete system to all the usual peripherals, a spokesman said.

Discussed within the book are I/O techniques, keyboard interfacing, LEDs, teletypewriters, printers, floppy disks, CRTs, cassette type media, industrial interfacing, analog-digital techniques and communications standards, according to the spokesman.

The book also presents a study of a multichannel communications system; another chapter is dedicated to various troubleshooting techniques.

Microprocessor Interfacing Techniques is priced at $9.95. Sybex is at 2161 Shattuck Ave., Berkeley, Calif. 94704.



MAP — 1. Refers to activities to transform information from one form to another. 2. A listing provided by a compiler to enable a programmer to relate his data names to the core addresses within the program.

MARK READER — A device capable of reading pencil marks on documents up to a size of 13- by 8 in. The marks can be positioned anywhere on the document. The reader's sensing cells are switched on by special clock track marks.

MASKING — A technique for sensing specific binary conditions and ignoring others. Typically accomplished by placing zeros in bit positions of no interest and ones in bit positions to be sensed.

MASS STORAGE DEVICE — Refers to various storage units with large capacity such as magnetic disk, drum, data cells, etc.

MASTER CLOCK — 1. Oscillator component which generates all the digital impulses required in an electronic computer. 2. The primary source of timing signals used to control the timing of pulses.

MEGA — Prefix denoting 10^6 (one million). Abbreviated M.

MEGABIT — A unit equal to one-million binary digits.

MEGACYCLE — A million cycles per second; 10^6 cycles per second.

MEMORY CYCLE — 1. A computer operation consisting of reading from and writing into memory. 2. The time required to complete this process.

MICR CODE — Refers to the special magnetic ink character recognition code that has been designed to consist of a set of 10 numeric symbols and four special symbols standardized as Font E-13B developed for the American Bankers Association.

MICROCOMMAND — Refers to various commands specifying elementary machine operations to be performed within a basic machine cycle.

MICROFILM, COMPUTER OUTPUT (COM) — Normal printed output of a computer reduced to one of several available microforms by a special output device that takes the place of the line-printer. The COM device allows high-quality output at speeds of 5,000 or more line/min.

MODE — 1. Refers to various methods of operation, e.g., the binary mode, the interpretive mode, the alphanumeric mode, etc. 2. The most frequent value in the statistical sense.

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Market Study Predicts

U.S. CPU Shipments to Jump 15% in '78

By Jeffry Beeler
CW Staff

CAMBRIDGE, Mass. — Rising demand for teleprocessing and data bases as well as for traditional DP applications will "strongly" boost hardware, software and services revenues during 1978, International Data Corp. (IDC) predicted in its latest five-year forecast of computer industry market trends.

Despite slackening sales in a few market sectors, the anticipated growth will continue to the benefit of all suppliers — especially mainframe vendors — at least into 1979, IDC spokesmen said here recently during the first of two scheduled presentations of the annual market survey.

In the general-purpose computer sector, the market research firm predicted that worldwide shipments by U.S. vendors will grow 15.1% this year to total $14.1 billion. Of that figure, domestic sales will account for $7.5 billion and international shipments for the remaining $6.6 billion.

Domestic shipments of general-purpose computers will increase 16.1% this year, compared with an estimated 14% growth in foreign sales, the market study forecast.

Last year, by contrast, mainframe sales in the U.S. totaled almost $6.5 billion, a 21.2% increase, while international shipments neared $5.8 billion, a 9.2% expansion, IDC noted.

By 1982, U.S. revenues from general-purpose computers will reach $18 billion, although annual growth in the sector will slow to 5.9%. At the same time, shipments to domestic users will grow 5.6% annually to total $9.5 billion, and international sales will rise 6.3% per year and total $8.5 billion, the report estimated.

Because of rising shipments both in this country and abroad, the worldwide installed base of U.S.-made general-purpose computers will grow from $76.8 billion last year to more than $86 billion this year — a 12.2% increase, IDC concluded. Domestic users will account for $47.1 billion of this year's total, while foreign users will contribute the other $39.1 billion, IDC predicted.

International Base

The international installed base, however, will grow 12.7% annually this year, compared with only 11.9% for its domestic counterpart, the company added.

In five years, the worldwide installed base of U.S. general-purpose computers will total $128.6 billion, a 9.7% increase from the previous year's figure. Of that total, U.S. installations will account for $69.4 billion and foreign users for $59.2 billion, the study predicted.

As expected, IBM accounted for almost 39,000 or 70.6% of the more than 58,000 CPUs installed domestically through last year and for almost 35,300, or 71.1%, of the nearly 53,200 computers installed internationally. Other leading U.S. vendors of general-purpose computers include Honeywell Information Systems, Inc., with 7.5% of the worldwide market; Univac, with an identical share; Burroughs Corp., with 5.8%; Control Data Corp., with 3.4%; and NCR Corp., with 2.3%, IDC found.

Since 1977, plug-compatible mainframe manufacturers have also emerged as a "major force" and have begun vying for industry importance with their more established competitors, the company added. Probably the most important new comer to the field is Amdahl Corp., followed by Itel Corp. and several other IBM-replacement-oriented vendors.

Of all the sectors in the mainframe market, the large systems area will prove the "most dynamic," the report concluded. In the U.S., the installed base of computers costing at least $4 million each will soar from $20 billion last year to nearly $45 billion in 1982, as major corporations develop worldwide data bases and distributed processing capabilities.

Minicomputer Sector

In the minicomputer sector of the CPU market, U.S. vendors this year will ship more than $3 billion worth of OEM and end-user products, with domestic sales accounting for more than $2 billion of that total. At the same time, the number of units U.S. minicomputer manufacturers will ship worldwide will total 100,000, IDC predicted.

By 1982, annual minicomputer sales of domestic firms will surpass $8 billion, equivalent to 200,000 units shipped, the

(Continued on Page 52)

IBM, Bell Headed for Clash In Mid-1980s, Analysts Warn

By E. Drake Lundell Jr.
CW Staff

WASHINGTON, D.C. — A major clash over markets is inevitable between IBM and AT&T in the 1980s, two major industry analysts agreed here at the recent DataComm '78 conference.

"AT&T is in essentially the same business as IBM, no matter what they say," Charles P. Lecht, president of Advanced Computer Techniques, Inc., said, while Frederic G. Withington, a consultant with Arthur D. Little, Inc., said it was "inevitable" that the two would compete even more than they have to date.

Lecht said the major collision between the two industry giants will come in the mid-1980s after the satellites of Satellite Business Systems (SBS) are launched, but Withington predicted the collision will result more from offerings planned for the late 1980s and early 1990s.

However, both agreed the big question mark in the equation is the threat of government regulation.

Legislators do not realize the significance of the coming clash and are not really equipped to deal with the issues raised, Lecht pointed out, while Withington said he hopes the government will not stop or stifle the innovative growth period ahead.

In reaching their conclusions, the two traveled slightly different paths.

By 1983, 87% of all computers will have some terminal hookups, Lecht noted, adding that computer mainframers that cannot offer a communications capability will end up as "component suppliers to those who do."

IBM's SBS, he said, is breaking the previous lines between computers and communications by placing a computer mainframe maker strongly in the communications business — even if only through a subsidiary.

Writeoffs for AT&T?

At the same time, AT&T could be facing huge writeoffs — in the neighborhood of $20 billion — if its terrestrial plant is outmoded or leapfrogged by satellite services such as SBS, he noted.

To counter this, AT&T is developing communications systems such as its as yet unannounced Advanced Communications System (ACS) that will handle many communications functions previously handled in a mainframe or front-end-type processor, Lecht predicted.

ACS, he said, will have the capability for data capture and data entry and will provide a host of preprocessing services formerly handled by communications software on a mainframe. The line between the two has always been fictionally drawn, Lecht noted, and it will be even more blurred in the 1980s when it will be impossible to tell whether computers are the slave of communications or vice versa.

With the development of ACS, the battle will really begin, he predicted, because IBM's Systems Network Architecture (SNA) will not be able to coexist with the Bell ACS offerings.

IBM Perspective

Withington looked at the picture from the IBM perspective, noting that pretending to be president of IBM was one of his favorite fantasies.

IBM wants to keep up its dramatic growth, starting from its base in the data processing and office markets, so the next step is integrating its word processing systems into networks and then having links with its DP base, he said. This will call for the develop-

(Continued on Page 56)

Fujitsu Introduces 64K RAM

SUNNYVALE, Calif. — Fujitsu Ltd. has announced what it claims is the world's first production-type 64K dynamic random access memory (RAM).

Fujitsu officials said the component, which contains about 150,000 circuit elements, will be available for customer evaluation by early spring and production is planned for this fall.

The MB 8164 RAM is produced using conventional photolithographic techniques and the double-poly embedded field oxidation process.

The product utilizes a 2-micron photolithographic process with an effective channel length of 2 microns. These extremely fine patterns and short channel transistors make possible a 33.5K chip that is not much larger than Fujitsu's 16K chip, the company said.

The chip size reportedly contributes to the product's 110-nsec access time and 250 mW power consumption.

The MB 8164 is packaged in a 16-pin ceramic DIP, and the pin outs are Jedec standard. Using the device, a 1M-byte memory unit will require only four printed circuit boards, each containing 32 devices, Fujitsu said.

The unit reportedly utilizes power supply voltages of 7V and -2V. All inputs and outputs, including clock and control inputs, are fully TTL-compatible, Fujitsu added.

Company officials noted that while some manufacturers had converted to the 16K RAM, which became available in 1976, the 4K RAM is still considered the industry standard. The 64K RAM, however, remains the device that manufacturers really want for the 1980s, they added.

CPU Shipments Seen Jumping 15% This Year

(Continued from Page 51)

market research firm continued.

Last year, Digital Equipment Corp. ranked as the leading U.S. mini vendor, with CPU sales of $1.1 billion, or 41% of the country's total revenues in the field. Hewlett-Packard Co. placed a distant second, with $390 million in shipments (14%) of the domestic market, followed by Data General Corp., with $279 million (10%), the survey found.

Other leading U.S. competitors in the minicomputer area include HIS, with 1977 sales of $130 million; Perkin-Elmer, with $86 million; General Automation, with $84 million; and Texas Instruments, Inc. with $80 million.

Significantly, IBM, with minicomputer sales last year of only $70 million, accounted for only 3% of the domestic mini market. By 1982, however, IBM's share will jump to 15% to 20%, an IDC spokesman predicted.

'Profound' Growth

The data communications and data entry products market will also experience "profound" growth during the next five years, the report said. Starting from $11.5 billion last year, the value of U.S. shipments in that sector will climb to $28.5 billion in 1982, when some seven million terminals will be in use.

Much of that growth will stem from sales of intelligent or "application-specific" products like automatic teller terminals and point-of-sale units, the study predicted.

Turning its attention to the other sectors of the U.S. computer market, IDC arrived at the following conclusions:

- The rapidly maturing software and services industry, which grossed nearly $6 billion last year, will near $12 billion by 1982. The service side of the industry, meanwhile, accounted for more than $1 billion of the 1977 figure and will rise to $2.5 billion annually five years from now.
- Emerging applications for computer output microfilm, word processing and information transmission techniques like facsimile will boost the installed base of computer output devices to five million units by 1982. Between now and then, the cumulative value of that installed base will grow to $20 billion.
- Worldwide shipments of American OEM products will more than double to $5 billion between 1977 and 1981. Much of the growth will stem from minicomputer sales, which in the OEM sector will climb from $935 million in 1977 to $2.3 billion in 1981. Printers and low-cost memory products will also contribute to the growth in this market.

Small Systems Seen Facing Growth Period

LOS ANGELES — The U.S. small business computer market will grow 35%-40% during the next five years, with the low-end sector attracting increasing attention from hardware vendors, according to Carl Jeremias, marketing vice-president of Basic/-Four Corp.

Speaking at the southern California introduction of the firm's System 200, Jeremias predicted that rapid expansion in the low-end sector of the small business computer market will double Basic/Four's business during the next 10 years.

"The market for small systems is extremely important when you consider that for every business with sales greater than $1 million, there are 500 companies with annual revenues of less than a million," he said. "But the key to capturing that market will be inexpensive, easy-to-implement software."

Contradictory Trends

Among other comments, Jeremias noted that the small systems market is currently characterized by two apparently contradictory trends.

On one hand, hardware and software are becoming "extremely sophisticated," he said. On the other, small systems are becoming increasingly transparent to their users.

Success in the small systems market depends on providing hardware that is easy to operate, uses everyday business terminology like "profit" or "loss" and doesn't require constant supervision by a highly paid programmer.

"We believe a standardized approach like the System 200 software is the answer for this market," Jeremias concluded.

"Naturally, such systems are not going to work for every business, but there are thousands of small companies with essentially the same routine office requirements."

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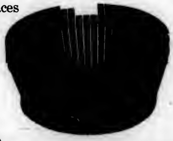

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Seen at $1 Billion by '82

Annual 18% Growth Forecast for Medical Gear

By Jeffry Beeler
CW Staff

SAN JOSE, Calif. — The U.S. market for medical information systems totaled $476 million last year and will grow an average of 18% annually to exceed $1 billion by 1982, Creative Strategies, Inc. (CSI) predicted in a newly issued industry report.

Most of the anticipated growth in the domestic market will occur between 1980 and 1982, CSI said.

At the same time, the world market for medical information systems will expand an average of 19% annually and total about $1.5 billion in 1982, the study forecast. Last year, by contrast, that market totaled approximately $622 million.

In its report, CSI divided the medical information systems market into three sectors: users, applications and suppliers. The users area in turn consists of three smaller sectors — hospitals, nursing homes and medical groups.

In the hospital sector, the market totaled $419 milion in 1977 and will grow 18% annually through 1982, when it will approach $940 million. Most of this anticipated growth will result from the increasing need to implement effective financial planning and budgeting systems, CSI said.

But some of the increase will also result from the growing use of medical information systems in patient care applications like acquiring patient data from clinical laboratories, pharmacies and radiology laboratories.

In the nursing home and medical group sectors, the market will expand an average of 20% annually, from $57 million last year to an estimated $140 million in 1982, the industry report forecast.

Most large domestic clinics currently rely on batch-type service bureaus for their automated accounting functions. As early as this year, however, about 200 of the largest clinics will begin trying to replace these service bureaus with in-house computing systems, the study predicted.

The most likely applications for medical information systems in nursing homes and medical groups include the standard accounting functions, scheduling and appointment management. Systems with more extensive capabilities will probably remain financially unattractive at least through the next three years, CSI warned.

Applications Market

Elsewhere in its study, the market research firm divided the medical applications market into eight sectors: accounting and financial management, admission-discharge-transfer, clinical laboratory, pharmacy, radiology, medical records, order entry and communications. Few hardware vendors try to compete equally in all these sectors, but rather specialize in the areas that promise the greatest financial return, the research firm explained.

During the next five years, the clinical laboratory applications sector will grow faster than any of the other seven areas, primarily because of the influx of low-cost, in-house minicomputers for daily processing. CSI predicted the clinical laboratory sector will increase 26% annually, from $43 million last year to $137 million in 1982.

Most of the medical information systems installed in the U.S. will serve as accounting and financial management aids. During the next five years, however, a large and almost saturated market base will make accounting and financial management the slowest growing of the eight applications market sectors, the industry report concluded.

By 1982, medical systems will begin handling other patient care applications like diet management and inventory, the study added.

Domestic suppliers of medical information systems fall into five categories: hardware vendors, time-shared or shared systems manufacturers, in-house or turnkey systems vendors, total systems makers and other companies, which include consultants and multihospital groups that market DP services to other hospitals.

Of these five types of suppliers, the hardware companies held the largest share — more than 40% — of the domestic market in 1977, CSI found.

Although more than 50 companies vie for shares of the U.S. medical information systems market, four competitors account for 47% of total domestic sales. Most suppliers hold very small market shares and compete primarily in the well-established accounting and financial management systems sector, CSI noted.

As expected, CSI found that suppliers of medical system hardware differ in their areas of technological specialization. Some companies concentrate on hospitals in a specific size range; others focus only on nursing homes and medical groups, while still others serve the entire market spectrum.

In the international market, IBM ranks as the leading medical systems supplier, followed by Siemens, International Computers Ltd., Univac, AEG-Telefunken, Digital Equipment Corp. and Burroughs Corp.

Although many companies have penetrated this market through acquisition or a novel marketing approach, expansion has slowed, and some firms have even left the fray. Most companies that fail do so either because they underestimated the difficulty of landing systems sales or because the large resource outlays required to enter and stay in the business outstripped their financial capabilities, CSI said.

Supershorts

Ampex has separated its instruments recorder and computer peripheral products sales staff into two distinct marketing areas.

—

Down under, Qantas has decided to drop its IBM systems in favor of Amdahl Corp. as part of a $9 million updating of its Qantum computer operation. The airline is replacing two 360/65s with Amdahl 470V/5s, but two 360/65s will remain in operation for reservations and departure control.

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Analysts Predict IBM, Bell Clash in Mid-'80s

(Continued from Page 51)

ment of both graphics and image processing systems, which will require very wide bandwidth communications systems, such as will be available from SBS, he added.

As these functions get distributed on communications nets, he predicted, IBM will then "have to get into voice," possibly to the extent of even supplying telephones.

Presently, IBM and AT&T compete in the terminal area to a great extent, he said, noting that AT&T's teletypewriter is one of the most popular terminals and that the Dataspeed 40 gear is actively competing in the market.

Withington also downplayed some of the things people have said might constrain the two from competing.

For example, he said many people have said that the threat of antitrust action against IBM would constrain the firm. But, he noted, IBM has been more aggressive in price cutting against the plug-compatible CPU makers than it ever was against the peripherals firms, even though it is being sued on antitrust grounds now.

In addition, the two firms would not stop being customers for each other's equipment even if they became competitors, as some have predicted.

Withington predicted that the confrontation would start on the equipment front with IBM coming out with more and more terminal equipment, initially specialized for the SBS, and including such things as facsimile, video and audio equipment for teleconferencing, and remote printing devices. In addition, it will get into the business of multifunctional units to provide such services.

Furthermore, IBM is heavily involved in fiber optics research and may offer fiber optics systems for in-plant use, he said, as well as entering the PBX marketplace with its Carnation unit that has been available in Europe for almost five years but never introduced here.

Executive Corner

- Daniel F. Sullivan has joined Bunker Ramo Corp. as divisional vice-president and general manager of Brokerage Systems.
- John G. Henry has been appointed vice-president of product marketing at Centronics Data Computer Corp.
- Gary E. Polaczyk has been elected corporate controller at Control Data Corp.
- J. Thiel Sullivan has joined Computer Sciences Corp. as vice-president of the Information Sciences Center of the Systems Division.
- Ralph Johnson has joined Telenet Communications Corp. as vice-president of marketing.
- Robert E. Huettner has been appointed vice-president of engineering at Intertel, Inc.
- Thomas K. Carpenter has been appointed to the post of president of MI^2 Corp.
- Thomas E. Bailey has been named vice-president of engineering and Walter A. Freeman has been named vice-president of consulting at Data Processing Security, Inc.
- Edward Lee Bryan has joined Harris Corp.'s Data Communications Division as vice-president of product planning.
- A.M. Cosentino has joined Microdata Corp. as senior vice-president in charge of domestic sales, marketing and service organizations. P. Cleveland will be in charge of planning.
- Ron Lightowler has been named computer output microfilm service administrator for U.S. Datacorp.
- Jon S. Gould has been named vice-president of Conversational Systems Corp.'s subsidiary, DDP Products, Inc.
- Robert A. Billhimer has been named vice-president, marketing, for Monolithic Systems Corp.
- William Flinn has been appointed national sales manager, Industrial Sales Division, for the Panasonic Co.
- Robert L. Runge has been appointed vice-president, systems development, of Sycor, Inc.
- Harold M. Wishnow has been named a vice-president of PRC Data Services Co.
- Don M. Muller has been promoted to the position of executive vice-president and chief operating officer at Pertec Computer Corp. Allen Lay will move to corporate headquarters as senior vice-president, market development.
- Dr. Earl Jacobs has been appointed vice-president and general manager of Computer Automation's Industrial Products Division.

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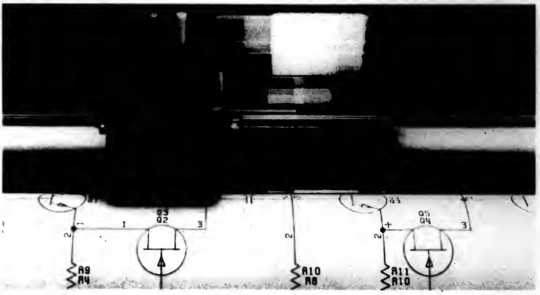

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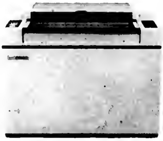

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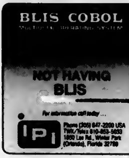

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Modcomp Hopes Supermini Signals Comeback

By Esther Surden
CW Staff

NEW YORK — In a move that Modular Computer Systems, Inc. hopes will signal its comeback into active marketing and aggressive promotion, the firm recently announced a system destined to be the first member of a family of superminis.

The Classic Series 7860 system (see Page 45) competes with offerings from the firm's competitors: Digital Equipment Corp., Systems Engineering Laboratories, and Data General Corp., according to Kenneth Harple, Modcomp president. It was designed for users in the firm's traditional market areas — communications, industry and science.

The introduction of the system was Modcomp's first public announcement in more than a year. "After our loss in '76, we devoted our time to strengthening management," Harple said. A new chairman of the board was appointed and management was reorganized, resulting in a better financial picture, he noted.

Both receivables and inventories have been greatly reduced since the firm's management shakeup, he stated.

But the last year was "not an aggresive one in respect to marketing and promotion," Harple said. During the period of silence from the Fort Lauderdale, Fla., based firm, Modcomp was interfacing with its users, trying to determine their needs.

The result of this dialogue was the family of systems whose initial member was introduced. "This year we will spend $1.5 milion on marketing and promotion," Harple said, and will expand the sales force.

Six more members of the Classic line are scheduled for introduction this year, with the next announcement planned for June.

CAI a Possibility

Although the systems are aimed at the firm's traditional marketplace, Harple forecast that the Total data base management system and Cobol introduced with the systems "will give us opportunities in new markets." Modcomp plans to target three specific vertical markets in the future and concentrate its efforts in those areas.

One of the areas the firm is considering is computer-aided instruction (CAI), a field Modcomp feels will soon open up to minicomputers. The University of Illinois is running Plato — which usually runs on a large-scale Control Data Corp. machine — on the Modcomp mini.

This development presents a bright picture for the company, Harple said, explaining "the market has been untouched because the price of the hardware has been out of line" for most users.

Speaking about the firm's brief foray into the turnkey minicomptuer arena with its acquisition of ECS Information Systems, Inc. and its subsequent pull out of that business, Harple said, "It turned out to be a lot easier [to get rid of the venture] than I thought."

Contracts

Bunker Ramo Corp. has received a $1.1 million contract from United States National Bank of Oregon in Portland for the installation of Bank Control System 90 data terminal equipment in the bank's 158 branches.

Bradford National Corp. has signed long-term agreements under which its subsidiary, Bradford Financial Processing Services, Inc. will provide computerized trust accounting services to five banks; Industrial National Bank of Rhode Island, Commonwealth National Bank in Harrisburg, Pa., Citizen's National Bank of Evansville, Ind., American National Bank of Austin, Texas and the Capital National Bank in Houston.

The Pertec Division of Pertec Computer Corp. has signed a $350,000 two-year contract with General Robotics Corp., Hartford, Wis. to supply T8000 tape drives, D3000 cartridge disk drives and FD500 flexible disk drives for use in the General Robotics CD/X3 cartridge system and FD/X3 floppy disk system.

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Fort Lauderdale, Florida 33306
(305) 561-5226

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When the Name of the Game is Subsystem Cost Per Byte, We Have the Only Game in Town.

Ampex and MSC. Masterminds of more for less.

Over there is where you are going to put your snazzy, new, super-sophisticated minicomputer. Your PDP-11, HP3000 or 21MX. That Nova, Eclipse or the latest miracle from Interdata or Microdata. And over here, the space you've reserved for the disk subsystem to best meet your mass storage needs. The space where much of your computer's promise is going to spring to life. And the space where many of its potential problems might also be born.

It's to talk to you about that space that we've purchased this space. We are Microcomputer Systems, a company that among other things makes disk controllers. Together with Ampex, a company that among other things makes disk drives, we are offering disk subsystem packages that meet your top line performance requirements while you meet your bottom line cost objectives. Disk drives from Ampex's justifiably respected family of storage modules combined with our Series 1000 disk controller, a product of advanced microprocessor-based technology that has been field-proven to be the most reliable and maintainable in the business.

In short, not only do we think we can fill that subsystem space for you, we think we can fill it with the best subsystem at the lowest cost per byte.

Ampex. A familiar name in disk drive quality...and innovation.

What's in a name? Obviously more than Romeo thought when he uttered that now famous line. In the mass storage market, what is in a name — or behind it — can help open a door or close a sale. The name Ampex, for instance, implies credentials that are generously delivered by its product line. Performance. Reliability. Maintainability. Quality control. Innovative engineering technology. And distinguished manufacturing techniques.

More specifically, that part of the Ampex product line that helps make up the MSC disk subsystem packages — the DM940, DM980, DM9100, DM9200 and DM9300 — offers a full range of capacities from 40 to 300 megabytes and the kind of feature list you would expect from a company like Ampex. Total family plug compatability. Standard and custom interfaces. Variable sector formatting. Variable length record format. Double density upgrade on the 940 and 9100. Dual port upgrade. Simplified maintenance design. Changeable logical unit address. And, of course, any number of options to meet any number of needs.

Speaking up for the silent partner. The MSC Series 1000 Disk Controller.

The controller half of our subsystem packages is not as well known as our disk drive partner. But as a happily growing number of customers and a painfully groaning number of competitors are learning, Microcomputer Systems is a name to be reckoned with.

And little wonder. The Series 1000 is the consummate controller. With software support for all popular minicomputer operating systems. Microprogrammed controller architecture. Full ECC error correction. And operator-oriented self-testing capability. To be direct, the MSC Series 1000 is the most flexible, efficient, functional, maintainable, reliable, feature-filled and affordable intelligent controller on the market today.

Be the bottom line hero in your company. Buy the top line subsystem from ours.

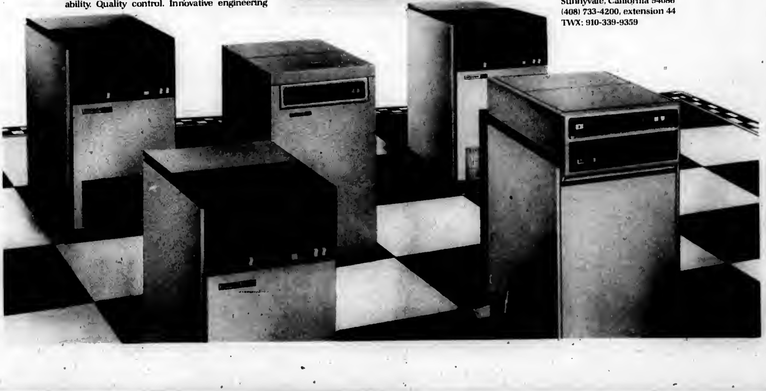
This is the part of the ad where most companies trying to sell you a disk subsystem would take a lot of features and a lot of dollars, wrap them into one seemingly irresistible package, tie it all vaguely together with several smart sounding terms like "maximum cost efficiency" and "price/performance ratios," then run it up the flagpole.

We'd prefer to put it more bluntly. Yes, we think the MSC/Ampex subsystems are, feature for feature, the best that you can buy anywhere today. But, with some estimable competition out there, the most important fact is that the MSC/Ampex subsystems deliver the lowest subsystem cost per byte. Period. Lower than Systems Industries. Lower than CalComp.

Doubt it? Pick up the phone, call (408) 733-4200, extension 44 and check it. After all, this is a game we're both playing for keeps.

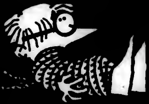
microcomputer systems corporation

440 Oakmead Parkway
Sunnyvale, California 94086
(408) 733-4200, extension 44
TWX: 910-339-9359



Your computer is the corporate safe, and it is always open...without PANEXEC

[illegible] that safe. And they are vulnerable. Because no matter how many [illegible] passwords are needed to enter [illegible] every year.



[illegible] PANEXEC [illegible]

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We are looking for sales professionals to sell our mini-computer systems to end-users. For the right individuals, these are truly unique and unusual opportunities for career and financial growth. To be considered, applicants must have prior sales/marketing experience in the mini-computer and/or small computer business systems marketplace. Compensation will include base salary plus incentives, and a liberal employee benefit package. Send detailed resume including current earnings to our Employment Manager.

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- Successful candidate should have 2-3 years experience in automated and manual systems and procedures.
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(617) 423-6440

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(716) 842-0801

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(214) 363-3300

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(713) 961-3271

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Central Missouri service firm. Large 360 shop COBOL, RPG II.

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To 21K

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St. Louis, MO 63105
(314) 727-1535

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Contact:
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Gateway Towers
Pittsburgh, PA 15222
(412) 471-5946

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Northwest data center requires a **software programmer** with solid experience in IMS,VSAM, and TP monitors. Company is growth oriented and needs heavy weight software type for the care and feeding of a large scale IBM system. **Salary to $23,000.**

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PROGRAMMER
SR. PROGRAMMER
ANALYST

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The successful applicants will have a solid background in OS COBOL and experience in either manufacturing or financial systems. A knowledge of TSO, IMS, or RJE are a real plus. Excellent fringe benefits, **starting salary to $23,000** and relocation expenses paid for out of town applicants.

Contact Duncan White or forward resume to:

ROBERT HALF
Personnel Agencies
Of L.A., 3600 Wilshire
(213) 386-6805
Of Orange, 500 S. Main
(714) 835-4103

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Local prestige manufacturing company needs analysts who have come up through programming; one in financial applications; one in manufacturing cost applications. **Starting salary to $20,400.**

For the career-minded analyst. **A Sr. Analyst** position; must have Financial or Accounting Systems experience. This is a major utility with excellent advancement possibilities. **Base salary to $22,000.**

Major manufacturer needs **Applications Software Support Specialists** to work in developing and maintaining large-scale applications; e.g., **Data Base Managers, Librarians, Generalized Application Packages. Salary range to $25,000.**

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777 E. Wisconsin Ave.
Milwaukee, WI 53202
(414) 271-9380

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All fees and expenses paid by client companies. For confidential review of where you might fit,

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Robert Half
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SR. PROGRAMMER/ANALYST

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PROGRAMMERS	
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os/Cobol,Cics/vs	To 18K
IMS/PL1.sys Dev'l	To 19K
SYS3/15D CDBOL	To 15K
SYS3/12 RPGII	12-20K
EE'S	
BS 5 yrs Software/CDC	22K
DP COORDINATOR	
NCR.BURR. Fin'l	20-25K

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Central New Jersey positions available in State Government agency. Experience in 370/158 using CICS and DL/1. Must be able to code in COBOL or BAL.

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Member of a design team responsible for specification, design, and testing of MOS microprocessors and microprocessor peripheral devices. Will be responsible for MOS system, logic and circuit design, planning and supervision of chip layout, development of test programs, device testing, and characterization. Requires BS/MSEE and 1 year circuit or logic design. MOS experience desirable.

MOS Microprocessor Systems Engineers

Responsible for the specification, design and programming of microprocessor-based systems from concept through production. Requires BS/MSEE and 1 year experience in assembly level programming, logic hardware, and minicomputer and/or microprocessor software.

Product Engineers

Work with a team of process engineers, device and system designers, and production personnel to implement new products into production and into the market. Quickly assume responsibility for test generation, yield improvement, cost reduction, and device characterization of MOS LSI devices. Requires BSEE or physics and 2 years' applicable experience. Requires knowledge of LSi fabrication and testing.

Product Manager

Coordinate test development and product engineering for digital/analog MOS LSi circuits. Requires thorough understanding of digital LSi test techniques and/or familiarity with data transmission over switched communication network. Requires BS/MSEE and 3-5 years' related experience.

Product Marketing Engineers

Handle all product marketing responsibilities for geographic area for MOS memory or microprocessor products. Provide customer presentations, proposals, spec evaluations, and price and delivery negotiations. Develop penetration programs for market area and coordinate resources to pursue. Requires BSEE or CS and 2 years' related experience, and the ability to operate in rapidly expanding market environment.

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Analyze market opportunities. Participate in product definition for MOS microprocessor products. Prepare product documentation, pricing and merchandising for specific markets. Requires BSEE or CS and 3-5 years' applicable experience.

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Apply microprocessors and/or memories to systems designs. Basic design requirements include digital, analog, and systems programming from concept to prototype debug. Requires BSEE or MSCS with heavy emphasis on electronics and microprocessors/memories. Requires 2 years' related experience and assembly level programming.

If you qualify for any of the above positions, send your resume in complete confidence to: Staffing Manager/P. O. Box 1443, M.S. 605/Houston, TX 77001.

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Digital Computer Systems Administrator D.C. Superior Court

Large urban trial court with independent DOS/VS, CICS/VS 370/145 installation with distributed processing seeks aggressive, dynamic individual to plan, coordinate, and supervise its computer system. The individual will be responsible for expanding on-line applications into the juvenile and civil areas and planning for the development of a fully integrated court information system. Implementation of a data base management system throughout the court is planned.

The successful candidate, must have demonstrated management competence and technical ability and should have a minimum of a bachelors degree and 5 years of D.P. experience in progressively more responsible positions. Individual must have a proven ability to manage timely and successful completion of DP projects, must be able to develop short and long range DP plans, and provide internal training programs for DP staff and users. It is imperative that the individual selected be able to communicate successfully with court executives and other DP users as well as with DP personnel. It is desirable that applicants have experience in the use of data processing in the justice environment and DP management experience is preferred.

The job offers a salary in the range of $36,171 through $47,025 and excellent government benefits.

Respond by March 10, 1979 to director of personnel, D.C. Superior Court, 613 G St. N.W., Rm. 505, Washington, D.C. 20001, Providing a detailed summary of experience and references.

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data processing

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Dual Processor Operating Systems Developers or Architects
Software Quality Assurance Analysts

Micro Programmers/Communications
Process Control Micro Programmers
Point-Of-Sale Micro Programmers
Managers of Micro Programmers
DEC PDP-11 RSX-11 Systems Programmers
Data General AOS Systems Programmers
DEC System TOPS-10 Systems Programmers
HP 3000 Systems Programmers
RSTS/E Systems Programmers
DEC System-10 COBOL Programmers/Manufacturing & Financial

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Logic/Memory Design Engineers
Interface Design Engineers
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Test Systems Supervisors
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Firmware Architects
Technical Writers
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Field Service Engineers
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LSI Product Development Managers
Managers of I/O Product Development
Data Communications Architects

Communications Product Managers
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- Utilities
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COMMUNICATIONS

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This area provides early definition and design of future microcomputers in communications products along with initiation, early program management, and startup development of new programs. This group offers opportunities for individual contributions in a systems level scope of design from the conceptual stage to finished product. We require senior analysts with a minimum of 5 years in software plus knowledge of hardware in any one of the following areas: • Microcomputer Design • Communications Product Design • Communications Network Architecture • Systems Modeling Performance Measurement and Analysis.

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programmer/analysts

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SYSTEMS PROGRAMMER

Qualified individual must have Univac 1100 and Exec. 8 experience. This individual will be responsible for SYSGENS, tuning and troubleshooting of systems. Must have experience with Univac 1100, Assembler and COBOL. Knowledge of TIP/CMS and DMS preferred.

SYSTEMS SPECIALIST

At least 2 years systems analysis and programming experience with financial application, utilizing ANS COBOL is required. Experience on a Univac 1100 series and degree is preferred.

Racal-Milgo, Inc. offers excellent salaries, complete company benefits, liberal relocation allowance and the benefits of South Florida living. Send your resume in complete confidence to Miles Johnson, Employment Representative, or call collect (305) 591-5212.

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- **Large Mainframe, Mini and Micro Processor**
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This position will report to the Vice President-Finance. Responsibilities will include planning, developing, testing, and installing computer-based real time systems for use at the University and to assure that user service standards are maintained. Major areas of service include all financial and accounting functions for the educational and health care operations of the University as well as academic computing services support. Works in conjunction with the Director of Computers, who is in charge of production operations using IBM 370/SVS system, CICS and TSO with PL/I and COBOL as primary languages.

The successful candidate will be a proven effective manager, especially adept at communicating with users, oriented toward planning, developing and installing major systems, and ready to manage a strong professional staff. Experience in higher education or health care is not required. Master's degree or equivalent experience required.

We offer excellent compensation and comprehensive benefits including undergraduate tuition for family members. Position is located in western suburbs of Chicago. Qualified individuals are invited to submit resume, including salary history and expectations, in confidence, to:

*Personnel Director
Loyola University of Chicago
Lewis Towers Campus
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PROGRAMMER/ANALYSTS

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programmers

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MIDDLE EAST OPPORTUNITIES FOR SENIOR COMPUTER SYSTEMS ANALYSTS

E-Systems has positions open in Saudi Arabia, Egypt and Oman for Computer Professionals with the following qualifications:

Five to ten years experience in computer based systems using large mainframe computers and minicomputers. Must be capable of translating user requirements into system requirements, system studies to optimize the throughput rate and man-machine interfaces and, software system design including definition and design of large data base and communications systems. BS/MS degree in Computer Science or E E. Must be willing to travel (TDY) or relocate (PCS) in the Middle East to accomplish the task.

E-SYSTEMS
Garland Division
An equal opportunity M/F employer

If you qualify, send your resume to:
Employment Manager
E-Systems, Inc.
P.O. Box 6118
Dallas, TX 75222

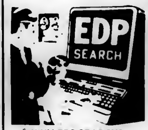
Communications Control Program

300 bed hospital/55 physician clinic on Florida's West Coast in need of experienced System/3CCP Communications Programmer.

Responsibilities include designing new and maintenance of existing communications based health care applications using RPG II and IBM Communications Control Program. Maintain and manage necessary system software to insure continuous operation in on-line environment.

Must haveat least 3 years programming in RPG with 1 year in use of System/3 CCP. Ability to communicate with using departments; organizational management important.

Submit detailed resume to Director of Personnel, Mease Hospital and Clinic, Dunedin, Florida 33528.



WHY EDP SEARCH?

Your file will be placed in our computer aided search system. When a position comes up in the area and discipline you desire it will automatically respond.

We have greater than 400 positions open across the U.S. Positions are available in most every major city! 120 associates coast to coast! Contact:

EDP Search
2401 NW 39th, Suite 200
Oklahoma City, OK 73112
(405) 525-8833

CAREER OPPORTUNITIES

We are currently seeking experienced professionals to work on a 370/156 in an IMS/DB/DC and TSO environment. Openings currently exist for:

Senior Systems Programmer

Requires a minimum of 3 years experience in systems programming. Must be able to SYSGEN and maintain SVS. A conversion to MVS is planned later this year.

Senior Programmer Analyst

Requires 3-5 years programming experience and thorough knowledge of COBOL. Experience with financial applications a plus.

We offer an attractive starting salary, a comprehensive benefits package and are located in an attractive rural setting within easy reach of major New England cities, ski areas and the ocean.

For prompt consideration, send a resume including current salary in complete confidence to George Mabey.

AO American Optical
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Southbridge, MA 01550
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PROGRAMMERS ANALYST

"Free Resume Service"
NORTHWEST • SOUTHEAST
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- Scientific and commercial applications
- Software development and systems programming
- Telecommunications
- Control Systems
- Computer Engineering

Send resume or rough note of objectives, salary, location restrictions, education and experience (including computers, models, operating systems, and languages). Our client companies pay all of our fees.

- NATIONAL
- PLACEMENT
- FOR PROFESSIONAL
- WOMEN
- P.O. Box 834
- HARTFORD, CT. 06142

We Aggressively Support Affirmative Action

EDP SPECIALISTS

Nationwide

• Dir Final Syst Midwest location	To $35K
• POS Proj Ldr Midwest Location	To $30K
• EDP Cost Cnslt Miami location	To $28K
• Syst Analyst Upstate NY location	To $24K

Fees assumed by Client Companies

Fees assumed by client co's.
LESLIE. KAVANAGH
505 5th Av. NY, NY 10017
(212) 661-0670 (agency)

EDP AUDITOR

Major chemical/manufacturing company with worldwide operations seeks an experienced EDP Auditor for their New York City Staff.

Candidate should possess programming/systems experience plus a background in either general or computer auditing. Big B and/or MBA is desirable, or equivalent experience.

Position will involve audits of large scale installations and specific applications within a dynamic EDP environment. Travel of up to 40% may be required. Competitive salary and benefits. Please respond with resume to:

CW Box 1473
797 Washington St.
Newton, MA 02160

Equal Opportunity Employer M/F

PROGRAMMERS

We are the largest, publically owned greeting card firm in the United States with sales exceeding $300 million per year. We have two immediate openings for our corporate headquarters in Cleveland, Ohio.

Scientific Programmer in our corporate research department, requires proficiency in Fortran and a working knowledge of APL. Duties involve programming to support market research experiments, writing specifications for sophisticated information retrieval systems, and coordinating the efforts of contract applications programmers.

Applications Programmer in our applications programming department which is responsible for a variety of business applications such as order processing, payroll, on-line accounts receivable, and production scheduling. Machine environment is 370/145 and 370/158 operating under OS/VS. Applicants should have ANS Cobol with OS JCL.

If you would like to be considered for either of the above positions, please forward resume including salary requirements to:

AMERICAN GREETINGS CORPORATION
10500 American Road
Cleveland, Ohio 44144
Attn: Employment Manager
An Equal Opportunity Employer M/F

EDP PROFESSIONALS

M.I.S. International, an internationally known computer systems integration and management consulting organization, requires specialized professionals for top assignments in southeastern Michigan, Indiana and Ohio areas.
MIS is developing advanced systems in.

- Financial Systems, Process Control, Communications, IMS, IDS, & DMS.

Knowledge of the following computers is desirable:

- MICROCOMPUTERS: Motorola 6800
- MINICOMPUTERS: PDP-11, SPC-16
- LARGE COMPUTERS: B6700/4700, IBM 370, H6000, U1100

Top salaries, fully paid fringes include life, health and dental insurances, moving allowance and educational benefits. To arrange an interview, call or send your resume to Mr. Gene Bryant.

M.I.S. INTERNATIONAL, INC.

31350 Smith Road
Romulus, Michigan 48174
(313) 326-7010

Computer Maintenance Specialist having at least two (2) years of actual maintenance experience with Electronic Associates, Incorporated machines including specifically the EAI Model 8945 Hybrid Computer, the EAL SPACER and the EAI SPACER 2000. This is a professional position on the staff of Michigan Technological University which is an equal opportunity educational institution and an equal opportunity employer. Please address Employee Relations, Michigan Technological University, Houghton, Michigan 49931.

UNIVERSITY OF VERMONT
ANALYST/PROGRAMMER

The Office of Management Information and Computing is seeking an Analyst/Programmer with two to four years of college and coursework in math or business related field. Applicants must have three to six years experience in systems analysis and programming, two of which must be in systems analysis; COBOL and IBM/DOS required. Applicants with experience in higher education applications, on-line systems or DBMS preferred. We offer an excellent benefits package. Salary is in mid-teens. Send résumé and three professional references by March 13, 1978 to University of Vermont, Personnel Office, Box 570, Waterman Building, Burlington, Vermont 05401.

An Affirmative Action Employer

Programming Manager

The University of Wisconsin-Milwaukee is seeking a Programming Manager to direct 15-18 programmers specializing in administrative applictions in the field of higher education. The candidate must have proven managerial experience, preferably in a university data processing environment, with a thorough knowledge of project management. Ability to communicate well both orally and in writing is important.

Candidates should be well-versed in concepts of data base technology; experience in training applicatons programmers and systams analysts is desirable. An appreciation for and knowledge of thorough documentation techniques is sought. Sensitivity to the human condition, talent to create a professional environment, and ability to motivate define some of the qualifications for this position. Candidate must have a college degree or equivalent work experience.

Salary commensurate with ability and experience. This is an administrative position reporting to the Director. Please send resume, including salary requirement, by March 15, 1978, in confidence to:

Director
University of
Wisconsin-Milwaukee
Computing Services Division
P.O. Box 413
Milwaukea, Wisconsin 53201
An Equal Opportunity/
Affirmative Action Employer

Director of Data Services
for Kent County. Responsible for overall implementation and maintenance of the Data Processing system. Develop intermediate and long range plans/supervise personnel/recommend acquisitions of hardware and software; work with users in providing training, developing procedures compatible with D.P. and statutory requirements, and developing plans for new D.P. uses. Desire Bachelor's in Business or Public Administration or Accounting; management level experience preferably in government, knowledge of state and county financial procedures and statues, and experience in selection of hardware and software. Submit application with salary requirements by March 15 to Kent County Personnel, 300 Monroe N.W., Grand Rapids, MI 49503. An Equal Opportunity/ Affirmative Action Employer.

PROGRAMMERS

PHILADELPHIA
INVITES YOU

To take advantage of our outstanding historical, cultural & recreational activities.
To grow personally & professionally.

If you are a PROGRAMMER or PROGRAMMER/ANALYST w/1-10 yrs EDP exp, current in the state of the art, proficient in COBOL, ASSEMBLER, RPG II, or EASYCODER- WE CAN HELP YOU FIND EXTRAORDINARY OPPORTUNITIES.

Make the move now! Please call or forward resume to:

ROBERT HALF
PERSONNEL AGENCIES
2 Penn Center, Suite 705
Phila, PA 19102
(215) 558-4550

Positions Available Nationwide
Call Toll Free
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Assured Confidentiality
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IBM or CDC software support. Several openings available.
DATA BASE DSGNRS 23-25K
IBM exp., Midwest location.
SOFT DESIGN & DEVELOPMENT 17-25K
Micro processors & mainframes. 1-3 years experience on any processor.
PROJ LDRS 25-30K
Manufacturing background in an IMS environment.
APPLIC PROGS 14-22K
Several openings throughout USA.

PARKER PAGE ASSOC.
P.O. Box 12308
Seattle, WA 98111
Offices in Wash. D.C.,
Chicago, Atlanta, Portland, Or.

SYSTEMS ANALYST

Blue Cross of Western Pennsylvania

is seeking candidates for an opening in its Systems Department. This position offers both an attractive starting salary and an excellent employee benefits package.

Applicants should have a minimum of 3 years' systems experience with a medium to large scale IBM 370 OS COBOL configuration.

Send resume, detailing educational background, work history, and present salary to:

William C. Cunningham
Personnel Services
Blue Cross
of Western Pennsylvania
One Smithfield St.
Pittsburgh, PA 15222
An Equal Opportunity Employer

PROGRAMMER ANALYST

Growing commercial bank is seeking an experienced programmer/analyst offering exposure to one of the most sophisticated banking on-line data base/data communications systems in the Northeast. Successful candidate will participate in the development of an IBM 3600 Financial Control System and an IBM 3790 Distributive Processing System. The successful candidate must have current experience in an on-line environment using ANS COBOL and Data Base Management systems. However, other candidates with equivalent experience and/or credentials are encouraged to apply.

We offer an attractive starting salary and fully paid benefits for this challenging position. For confidential consideration, please contact the Personnel Department at (617) 681-8096 or respond by resume to Bay State National Bank, P.O. Box 249, Lawrence, MA 01842.

Bay State National
BANK

An equal opportunity employer

COMPUTER SCIENCE

An academic staff position will be available beginning August, 1978 at the University of Wisconsin - Platteville. Undergraduate courses with emphais on teaching excellence. Computer science background with interest and/or experience in business and industrial applications. Slary upwards from 14K depending on degree and experience. Send resume and list of references to: Dr. Leonard Myers, Computer Science Department, UW-Platteville, Platteville, WI, 53818. An Equal Opportunity/ Affirmative Action Employer.

MINICOMPUTER MANAGER

A leading computer consulting and software firm in N.Y.C. A strong PDP11 background in consulting with proven management skills to assist clients in problem definitions and solutions.
$35,000 FEE PAID

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PERSONNEL AGENCIES
522 Fifth Avenue
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PROGRAMMERS/ANALYST

The Dayton area's largest and most progressive financial institution has openings for experienced Programmers and Systems Analysts.

Two years NCR NEAT/3 or NCR COBOL experience desired. Experience with CIF, CIRF and/or commercial bank applications preferred.

We offer an excellent starting salary plus an outstanding fringe benefit program. Send resume to:

Personnel Officer
Winters
National Bank & Trust Co.
Winters Bank Tower
Dayton, Ohio 45401

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MANAGER PRODUCT PLANNING

MDS...The Most Intelligent Choice For A Dynamic Career

The success of MDS is well known worldwide. From our modest beginning, we have grown to a $160 million, multi-national corporation in 14 short years.

And the bulk of the credit for our achievements must go to our people. Highly intelligent, highly motivated, dynamic professionals who have not only helped make us what we are today, but in the process have also carved out exciting and rewarding careers for themselves.

Due to current expansion, we have an immediate career opportunity in our product planning organization at our Los Gatos, California facility.

If you have experience in product or market planning for data entry equipment, intelligent terminals, data communications systems, or small distributed processors, you may qualify for a key position on our product planning team. Candidates should have previous experience in assessing trends and user requirements in the data entry, intelligent terminal and data communications segments of the data processing industry. You should also be skilled in converting requirements to functional specifications assessing hardware & software implementation of those specifications, and releasing completed products to a worldwide marketing organization. Creativity, attention and ability to interface with the technical community, the marketing organization, and end users are musts for product planning.

In addition to excellent compensation and fringe benefit programs, we offer the opportunity to grow with us as we continue to introduce significant new systems. For immediate, confidential consideration, please send resume including present compensation to:

MR. D.P. McCONNELL
Director, Corporate Personnel
Mohawk Data Sciences
985 University Ave., Los Gatos, CA 95030
An Equal Opportunity Employer M/F

MDS

DATA PROCESSING PROFESSIONALS

be with the best, be with BECHTEL

We're one of the international world leaders in the field of engineering and construction management. If you're looking for an innovative and active professional career in data processing, we offer outstanding opportunities. If you have a minimum of two years experience in the following areas we'd like to talk to you:

- **SENIOR SYSTEMS ANALYSTS**
- **BUSINESS PROGRAMMER/ ANALYSTS**
- **ENGINEERING PROGRAMMER/ ANALYSTS**
- **SENIOR SYSTEMS PROGRAMMERS**

Write or call in confidence: Mr. K. David Bales (415) 768-5942 collect. Bechtel Corporation, Employment Dept. 8-6C-8, P.O. Box 3965, San Francisco, CA 94119.

BECHTEL

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PROGRAMMERS

We need several information systems professionals to help us develop a new generation of systems. The basic hardware/software configuration is IBM 370/138, DOS/VS, POWER, CICS, DL/I, VSAM, SPM II, Assembler and COBOL. Our management approach is people-oriented with a strong emphasis on planning for continued growth in a wide range of medical and financial applications. Successful candidates for these programming positions will perform a complete scope of program development activities including logic design, instruction coding, documentation, program testing and user education.

We will select individuals based on employment background, work experience and education. Minimum qualifications include an Associates degree and 2 years experience. Contact:

W.M. Jones
Harper-Grace Hospitals
Human Resources Department
3990 John R.
Detroit, MI 48201
(313) 494-8082
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EDP Professional

We are seeking an EDP professional looking to advance your career opportunities. This position on our expanding EDP audit staff will offer the following challenges.

- Preinstallation system reviews
- Postinstallation system reviews
- Design and implementation of computer assisted audit techniques
- Support internal audit staff

You should have a college degree and a minimum of 3-4 years' systems/programming experience in a sophisticated computer environment. You will be trained in EDP auditing techniques, and good written and oral communications skills are essential. Familiarity with accoounting and insurance concepts is desirable.

Salary range is mid to upper teens. We offer a comprehensive employee benefits package. Please send resume and salary history in strict confidneca to Director of Personnel.

Mutual Benefit Life
520 Broad St., Newark, N.J. 07101
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Evans Products Company

DATA COMMUNICATIONS ANALYST

Pacific Northwest based Company has an opening in its MIS Department for an experienced Data Communications Technician. The applicant selected will participate in the evaluation, selection and monitoring of a Nationwide telecommunications Network. Previous experience with RJE and On-line telecommunications desirable. This experience to include a working knowledge of Host Processors, Communications Processors, Modems, Multiplexers, Data Terminal Equipment and Common Carrier Offerings. If qualified, please send resume and salary history in confidence to:

Chris Utter
Corporate Personnel Mgr.
Evans Products Company
P.O. Box 3299
Portland, OR 97208

Evans Believes in Equal Opportunity

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data processing

Assistant Director Of Computer Services

Denver, Colorado

Direct the activities of a group of systems analysts and programmers in the design and implementation of data processing systems in support of the administrative offices of the university. Must be able to work effectively with administrators at all levels of the institution in identifying the requirements for computing services. Bachelors degree plus 7 years experience in automatic data processing including at least 4 years of experience in the design and implementation of data processing systems. Should be familiar with modern techniques of data base management, on-line transaction systems, and structure design and programming. Mail resume to: University of Denver, University Park, Dr. D.W. Rechard, Director of Computing Services, Denver, CO 80208

Equal Opportunity Employer M/F

DATA PROCESSING MANAGER

Irvine based food supplement manufacturer seeks an individual who will be responsible for the operation of the DP Department. Position reports to the Vice President of Finance. Specific responsibilities to include system development, programming, machine operation of an IBM System 3/Model 15 environment and training of supporting staff.

Successful candidate will have experience with IBM System 3/Model 15, RPG-II, and CCP. Experience with computerized manufacturing control systems including forecasting will be helpful.

Please send resume and salary history to Vice President-Finance, P.O. Box 16307, Irvine, CA 92713.

CITY OF MADISON, WISCONSIN

DATA PROCESSING MANAGER

Managerial work planning, developing, implementing, and controlling EDP functions for centralized support services to City agencies. Graduation from accredited college or university in computer science, business administration or related field, which has included technical EDP courses and management coursework. Eight (8) years of experinece in managing a total data processing organization. Annual salary of $22,699 plus fringe benefit package. Application may be obtained from City Personnel, Rm. 501, City County Building, 210 Monona Avenue, Madison, Wisconsin 53709; or telephone (608) 266-4615. Applications must be received by 4/7/79.

Systems Software Technician/Analyst

Join a team of Data Processing professionals in directing the technical future of a major Virginia multi-bank holding company. Dominion Bankshares Corporation, located in the scenic Roanoke Valley surrounded by the Blue Ridge Mountains, is currently a twin 370/158, OSVS1, CICS, VM/CMS installation. Our statewide on-line environment consists of 3270's, remote System 3's, and Docutel ATM's. A position exists in the technical group with responsibilities that include support of the current configuration, computer performance evaluation, support for application areas, and evaluation of MVS, TSO, and VTAM/NCP.

The desired candidate must have high technical motivation and standards, at least 3 years of detailed experience in MVS or VS1 operating systems supporting a similar TP environment, and the ability to relate and interact with other departments in DP.

To take advantage of this opportunity with an excellent company, send resume, including present and desired salary, to Mrs. H. Lewis, Personnel Representative, Dominion Bankshares Corporation, P.O. Box 13327, Roanoke, Virginia 24040, or call (703) 362-7881.

Dominion Bankshares Corporation
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Top Salaries in the Sun Belt for D.P. Pro's

Current employment not jeopardized & confidentiality guaranteed. All fees paid by our client companies

BANK DP PLANS MGR	TO $28K
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BANK PROJECT LEADERS	TO $24K
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AVAILABILITY, INC.
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PROGRAMMER/ANALYSTS

Live and play in the mountains, woods and streams of northern Idaho.

Work with medium size Burroughs hardware on challenging projects.

Openings exist for various levels of experience and salary. We will provide training and opportunity for growth.

Write in confidence to:

COMPUTER SERVICES MANAGER
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P.O. Box 29
Kellogg, Idaho 83837
An Equal Opportunity Employer

PROJECT DIRECTOR BANK SYSTEMS-ARIZONA

General banking and data processing background required. Direct experience in central operations and branch operations required as well as direct knowledge of COBOL programming and data base concepts. Systems involve on-line terminals, ATM's, savings systems, installment and commercial loans. Prefer 3 to 5 years experience, salary commensurate with background. For immediate response send personal resume complete with salary history to The Arizona Bank, Human Resources Department, P.O. Box 29961, Phoenix, AZ 85038. *Equal Opportunity Employer M/F*

PROGRAMMER or PROGRAMMER/ANALYST

Due to a reorganization within our Data Processing department, we have an immediate opening for an individual who has a minimum of 2 to 3 years BAL experience in a DOS environment, preferrably with a Financial institution. The person we select will be given an opportunity to work in all facets of our On-Line systems.

COBOL and REAL time experience helpful, but not essential.

If you want to work in a challenging environment and are looking for a professional growth position, then you should consider us.

Excellent starting salary with many company paid benefits.

Please send your resume, in complete confidence, including experience and salary requirements to:

CW Box 1459
797 Washington St.
Newton, MA 02160

SYCOR

Sycor, Inc., a leader in the manufacture of distributed data processing systems, is currently seeking qualified individuals for:

EDITOR/TRADE SHOW ADMINISTRATOR

Position requires a Bachelor's degree in journalism, advertising, or other communication arts curriculum.

The ideal candidate will have a minimum of 5 to 10 years experience in a marketing communications environment with emphasis on press releases and publications. Trade show experience helpful. Employment with computer manufacturer or other related EDP organization a plus.

Will work closely with marketing staff, field personnel, and all levels of company management. Some travel involved. An excellent position for an aggressive, self-motivated person.

We offer a competitive salary, full benefit package and excellent opportunity for advancement.

Send resume and salary history, in confidence, to:

Linda E. Swehla
Salaried Employment Specialist

SYCOR, INC.

Sycor, Inc.
100 Phoenix Drive
Ann Arbor, Michigan 48104

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"Sycor Puts Computer Power Where the Work Is"

SYCOR

R S T S in COLORADO

Expanding company has two positions available for individuals experienced in the following fields.

TIMESHARING SALES

- Represent packaged applications software
- Offer generic computer resource
- Develop new market areas
- Salary plus commission

PROGRAMMER/ANALYST

- BASIC PLUS under RSTS/E
- MBA degree or accounting background
- Good personal communications skills
- Salary range $14K-$16K

EOI Computer Services
13693 East Iliff Ave.
Denver, CO 80014
(303) 758-4619

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computer hardware and software candidates RELAX

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(213) 986-4400

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Philadelphia Area
(219) 393-1600

DEALY-ROURKE
PERSONNEL SERVICE
1806 West End Bldg.
Suite 121
Nashville, TN 37203
(615) 329-1771

COMPUTER CAREERS INC.
Specialists-Data Processing
4730 Montgomery Lane
# 503
Bethesda, MD 20014
(301) 654-9229

members of
National Personnel Associates
Specializing in DP

DATA BASE ARCHITECT

Progressive company seeking individual with minimum of 4 years experience in data processing with emphasis in data base design. Will be responsible for designing data base architecture in converting applications from non-data base to a data base system.

Your capabilities dictate salary. Outstanding benefits package provided.

Please submit detailed resume and salary requirements to: CW Box 1475, 797 Washington St., Newton, MA 02160.

DATA PROCESSING PROFESSIONALS

Are you considering a career change for 1978? If so, we have immediate openings with the most progressive clients in North Carolina, nationwide and international. Immediate needs include:

Syst Designer	to $30K
Systs Developers	to $25K
Syst Analyst	to $23K
Sr. Prog Anal	to $21K
Prog Analyst	to $18K

If interested send resume or call Continental Personnel, Inc., P.O. Box 11321, Charlotte, N.C. 28209. (704) 525-2160

Honeywell Is Looking For Technical Writers

Operating Systems Documentation

We need an incisive writer who can work directly with engineering, systems and marketing personnel to produce clear, helpful user-documentation. You must have a college degree and 2-3 years related experience. In addition, you should have a solid working knowledge of small/medium operating systems and at least one higher level programming language - preferably COBOL. Above all, your lucid writing style must generate documentation that is a positive aid to our users.

Terminal Documentation

This top technical writer has a college degree and 2-3 years experience in preparing high technology documentation on terminals for systems analysts and applications programmers. You will communicate with software development personnel at their level of expertise and translate their information into concise, usable documentation. You must have a thorough background in minicomputer operating systems and a sound functional knowledge of communications, networking and distributed systems.

If the challenge of these positions appeals to you, and if you're interested in working in a dynamic, progressive environment, then we're interested in you. Please forward your resume and salary requirements, in confidence, to: Ms. Judy B. Heaton, HONEYWELL - MSISD, M/S 425, 200 Smith St., Waltham, Mass. 02154.

THE SEARCH IS ON

Honeywell

An Equal Opportunity Employer M/F

EDP Auditor

We seek an individual with broad based systems experience to perform EDP Auditing on our corporate Internal Audit staff.

Ideally, our candidate will be degreed with 3-5 years of Data Processing Consulting or related Systems experience. A Masters degree is a plus. Excellent communication skills are necessary.

Headquartered in Chicago, we are an NYSE Fortune 500 company and the nation's largest commercial printer. If you are qualified, please forward your resume, including your current salary, in complete confidence to:

Pat Klinge
Recruiting Coordinator
R.R. DONNELLEY & SONS CO.
2223 S. King Drive
Chicago, Illinois 60616

An Equal Opportunity Employer M/F

DIRECTOR OF MARKETING

- **COMPANY:**
  A revitalized growing division of a major corporation engaged in the design, manufacture, marketing and servicing of mini-computer systems for small business applications. Location — New Jersey/New York metropolitan area suburbs.
- **POSITION:**
  Total small business mini-computer line responsibility including product line management, national and international sales, technical support, advertising, business planning and marketing administration. Current marketing staff: 71 professionals.
- **QUALIFICATIONS:**
  Must have a demonstrable record of accomplishments in the minicomputer/small business applications marketplace.
- **COMPENSATION:**
  An attractive package commensurate with experience to include salary, incentives and benefits. For the right individual — the potential for a uniquely rewarding position.
- **APPLICATION:**
  Please send a detailed resume in confidence to our Marketing Placement Director, and please advise us of your current and desired earnings.

CW Box 1470
797 Washington St.
Newton, MA. 02160
An Equal Opportunity Employer M/F

FORTRAN-APL SUPPORT ANALYST

For Corporate Headquarters

National CSS, a leader in timesharing and remote computer services seeks talented individual with three to four years of experience writing systems, trouble shooting, and a working knowledge of either 370/OS, VP/CSS or virtual memory systems. Familiarity with Graphics packages and associated devices a definite plus.

With a professional background and these qualifications, you're probably right for this job, but what do you want? A visible spot with exceptional growth potential? A chance to work with state-of-the-art personnel and systems? The opportunity to be THE Corporate Support expert for our languge products, with heavy sales contact throughout the U.S. and Europe?

This position is based in our Corporate Headquarters in Fairfield County, Connecticut. The successful candidate should be able to communicate effectively with corporate and field sales personnel and assist them in all aspects of customer support. You must be creative, personnable and results oriented.

Please send resume, including salary history and requirements to:

Mr. T. Russell Gloersen
Manager Product Support Services

National CSS, Inc.

542 Westport Avenue
Norwalk, CT 06581
An equal oppty employer

SYSTEMS PROGRAMMER

A rewarding and stimulating career opportunity offering the professional and personal recognition you seek is available now at the new Earth Resources Observation Systems (EROS) Data Center. This facility is the national center for the processing and dissemination of spacecraft acquired imagery and electronic data of the Earth's resources.

Experience in systems software support of B-6700 computer preferred. Major efforts include support of:

- **B-6700 multi processor systems**
- **Data communications network**
- **Large on-line data base**
- **Mini computer image processing system**
- **Array processing hardware**

Excellent income, comprehensive benefits, relocation assistance, and the advantages of our midwestern lifestyle await you. Join Technicolor Graphic Services, Inc., a wholly-owned subsidiary of Technicolor, Inc., Hollywood, California, for an exciting career opportunity at the EROS Data Center. FOR PROMPT AND CONFIDENTIAL CONSIDERATION, OR ADDITIONAL INFORMATION, SEND RESUME TO:

Mr. J.C. Pfliger
TECHNICOLOR GRAPHICS SERVICES, INC.
P.O. Box 1242
Sioux Falls, South Dakota 57101
An Equal Opportunity Employer M/F

CAREER OPPORTUNITY

Teledyne CAE, a leader in gas turbine engine development, has an extraordinary career opportunity for an individual in the following area:

PROGRAMMER/ANALYST
REAL TIME DATA
ACQUISITION

Opening for Programmer to work with automated gas turbine engine test systems. Experience with interdata OS32-MT would be a plus. A degree of equivalent experience is desirable. Salary up to $20,000 commensurate with experience.

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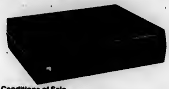

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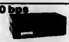
3600 bps 	**MODEM 3300/36** Dial or dedicated operation with reverse channel. Built-in auto-answer on dial-up	$3620 $85/mo.*	**$950** **$38/mo.***
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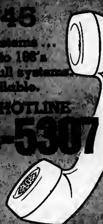

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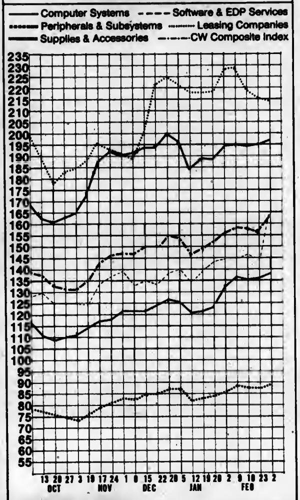

Earnings Reports

PRIME COMPUTER
Year Ended Dec. 31

	1977	1976
Shr Ernd	$1.46	$1.06
Revenue	50,032,000	22,797,000
Tax Cred	150,000	1,230,000
Earnings	3,926,000	2,429,000
3 Mo Shr	.48	.41
Revenue	16,831,000	8,020,000
Tax Cred	....	504,000
Earnings	1,386,000	945,000

SYSTEMS ENGINEERING LABORATORIES
Three Months Ended Dec. 23

	1977	1976
Shr Ernd	$.44	$.11
Revenue	11,644,000	7,924,000
Tax Cred	555,000	132,000
Earnings	1,249,000	314,000
6 Mo Shr	.76	.17
Revenue	21,435,000	13,926,000
Tax Cred	976,000	263,000
Earnings	2,125,000	471,000

FOUR-PHASE SYSTEMS
Year Ended Dec. 31

	1977	1976
Shr Ernd	$2.16	$2.25
Revenue	88,508,000	63,216,000
Tax Cred	1,179,000	3,090,000
Earnings	6,143,000	7,476,000
3 Mo Shr	.52	.54
Revenue	26,006,000	17,467,000
Tax Cred	....	809,000
Earnings	2,224,000	2,106,000

AMDAHL
Year Ended Dec 30

	1977	1976
Shr Ernd	$4.46	$3.30
Revenue	188,806,000	92,820,000
Tax Cred	8,965,000	11,010,000
Earnings	36,650,000	22,693,000
3 Mo Shr	1.09	1.60
Revenue	59,243,000	40,464,000
Tax Cred	.....	8,235,000
Earnings	8,990,000	12,721,000

TERMINAL DATA
Three Months Ended Dec. 31

	1977	1976
Shr Ernd	$.13	$.19
Revenue	1,925,200	1,800,400
Spec Cred	.....	21,500
Earnings	92,900	140,300

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Computerworld Stock Trading Summary

CLOSING PRICES WEDNESDAY, MARCH 1, 1978

All statistics compiled, computed and formatted by
TRADE QUOTES, INC.
Cambridge, Mass. 02139

E X C H		PRICE			
		1977-78 RANGE (1)	CLOSE MAR 1 1978	WEEK NET CHNGE	WEEK PCT CHNGE
	COMPUTER SYSTEMS				
A	APOAHL CCRP	22- 55	4A 7/8	- 5/8	-1.3
N	BURRCUGHS CORP	55- 91	60	+ 1/8	+0.2
C	CCPPUTER AUTOMATION	1R- 30	23	-1 1/2	-A.1
N	CCNTRCL OATA CCRP	20- 29	24 3/8	+1	+4.2
C	CRAV RESEARCH INC	15- 31	25 3/4	-1 1/4	-4.A
N	CATA GENERAL CCRP	35- 54	42 3/4	0	0.0
N	CATAPCINT CCRP	18- 41	37 7/8	- 3/8	-0.9
N	DIGITAL EGUIPMENT	37- 53	39 3/4	+ 1/2	+1.2
N	ELECTRONIC ASSCC.	2- 4	3 5/8	0	0.0
A	ELECTRONIC ENGINEER.	8- 1A	13 3/8	- 1/4	-1.8
O	FCUR-PHASE SYSTEMS	13- 23	21 1/2	+ 1/8	+0.5
N	FCXBCRC	28- 34	30	+ 1/2	+1.6
O	GENERAL AUTOPATICN	6- 9	7 5/8	+ 1/8	+1.A
G	GRI COMPUTER CORP	1- 1	1	0	0.0
N	HEWLETT-PACKARO CO	A3- ET	A4	+ 3/8	+0.5
N	HCNEYWELL INC	43- 55	44	0	0.0
N	IBP	245-28A	251 1/2	-3 1/4	-1.2
O	PANAGEMENT ASSIST	5- 11	10 1/2	+ 3/8	+3.7
O	PICROOATA CORP	7- 18	12 1/4	- 1/2	-3.9
O	PINI-COPPUTER SYST	5- 12	A 3/A	+1 3/8	+25.5
O	PGOULAR CCMPUTER SVS	5- 9	8 3/4	- 3/8	-A.1
N	NCR	32- 47	40 1/4	+ 1/8	+0.3
O	PRIPE CCPPUTER INC	12- 27	25 1/2	+1 1/8	+4.8
N	PEPKIN-ELMER	17- 22	17 7/8	+ 5/8	+3.A
N	RAYTHEON CC	18- 35	31 1/8	+ 3/8	+1.2
N	SPERRY RAND	30- 42	32 7/8	- 3/8	-1.1
O	SYCOR INC	8- 21	20 3/8	+ 1/A	+1.2
A	SYSTEMS ENG. LABS	5- 13	12	0	0.0
A	WANG LABS.	10- 14	12 1/2	+ 1/A	+2.0
	LEASING COPPANIES				
O	ALANTHUS CORP	3- 8	5 3/4	+ 1/8	+2.2
C	BOOTHE COURIER CORP	8- 14	15 7/8	- 1/8	-0.7
C	CCPDISCO INC	10- 18	9 1/2	- 1/4	-2.5
A	CCPPERCE GROUP CORP	1- 3	5/4	0	0.0
A	CCMPUTER INVSTRS GRP	1- 2	5/8	- 1/8	-15.3
M	DATRONIC RENTAL	0- 2	1 1/4	0	0.0
A	CCL INC	1- 4	3 1/8	- 1/8	-3.8
N	OPP INC	6- 10	8 1/8	- 1/4	-2.9
N	ITEL	13- 22	16 5/8	0	0.0
N	LEASCO CORP	19- 27	2A	+ 1/4	+0.9
O	LEASPAC CCRP	1- 2	1 1/4	+ 1/8	+11.1
A	PICNEER TEX CORP	5- 11	5 3/4	+ 1/8	+2.2
N	U.S. LEASING	10- 18	15 5/8	+ 1/A	+1.9

EXCH: N=NEW YORK; A=AMERICAN; P=PHIL-BALT-WASH
L=NATIONAL; M=MIDWEST; O=OVER-THE-COUNTER
O-T-C PRICES ARE BID PRICES AS OF 3 P.M. OR LAST BID
(1) TO NEAREST DOLLAR

E 8 C H		PRICE			
		1977-78 RANGE (1)	CLOSE MAR 1 1978	WEEK NET CHNGE	WEEK PCT CHNGE
	SOFTWARE & EDP SERVICES				
O	ADVANCED COMP TECH	0- 2	1 1/2	+ 1/8	+9.0
O	ANACCMP INC.	7- 10	9 1/8	+ 3/8	+4.2
A	APPLIED CATA RES.	5- 10	9 3/8	+ 7/8	+10.2
N	AUTCPATIC DATA PROC	23- 30	24	+ 1/4	+1.0
C	CCLEPAN APEPICAN COS	1- 2	1 1/4	- 1/8	-9.0
O	CCMPU-SERV NETWORK	9- 15	9 1/2	0	0.0
C	CCPP ELECTICN SYSTMS	6- 10	9	0	0.0
C	CCMPUTER HORIZONS	1- 2	2 1/A	+ 1/4	+12.5
C	COPPUTER NETWORK	6- 11	8 3/8	- 1/8	-1.4
N	CCPPUTER SCIENCES	7- 10	8 7/8	+ 1/8	+1.4
O	CCMPUTER TASK GROUP	1- 2	1 3/8	- 1/8	-8.3
O	CCMPUTEP USAGE	1- 3	1 3/4	0	0.0
C	CCPSHARE	5- 9	8 1/4	0	0.0
O	DATA DIMENSIONS INC	3- 5	5	+ 1/8	+2.5
O	DATATAB	1- 2	1 1/4	0	0.0
N	ELECTRONIC CATA SVS.	14- 20	17 7/8	+1	+5.9
O	INSYTE CORP	2- 3	1 3/8	+ 1/8	+10.0
G	IPS COMPUTER MARKET.	1- 2	2 1/4	0	0.0
O	KEANE ASSCCIATES	3- 4	3 3/8	- 1/4	-A.8
O	KEYDATA CORP	1- 3	1 1/R	- 1/4	-18.1
A	LCGICON	7- 17	13 3/4	+ 1/8	+0.9
A	MANAGEMENT GATA	1- 2	1 1/8	+ 1/4	+28.5
A	NATICNAL CSS INC	10- 18	1A 5/8	-1	-5.A
O	NATIONAL CATA CORP	4- 8	7 3/8	- 3/8	-4.8
A	CN LINE SYSTEMS INC	18- 23	22 5/8	+1 1/4	+5.8
N	PLANNING RESEARCH	3- 8	4 1/8	+ 1/8	+3.1
O	PRCGRAMMING C SVS	1- 1	5/8	0	0.0
O	RAPIDATA INC	2- 4	3 1/4	0	0.0
O	REYNOLDS & REYNOLDS	17- 21	18	0	0.0
O	SCIENTIFIC COMPUTERS	1- 4	2 7/8	+ 1/8	+4.5
O	TYPSHARE INC	14- 23	20 1/8	- 7/8	-A.1
A	URS SYSTEMS	4- A	5 1/2	+ 1/4	+4.7
N	WYLY CORP	1- 3	3 1/8	+2 5/8	+525.0
	PERIPHERALS C SUBSYSTEMS				
N	ADDRESSOGRAPH-MULT	10- 17	1A 1/2	+1 1/4	+8.1
O	ADVANCED MEMORY SYS	7- 9	8 1/8	+ 1/8	+1.5
N	APPEX CCRP	8- 13	12	- 3/8	-3.0
O	ANDERSON JACOBSON	3- A	4 7/8	+ 1/8	+2.A
N	APPLIED CIG DATA SYS	10- 20	13 1/2	- 1/8	-0.9
O	BEEHIVE INT'L	5- 12	5 1/2	- 3/8	-A.3
A	BOLT,BERANEK C NEW	6- 9	5 7/8	- 1/8	-2.0
N	BUNKER-RAMO	8- 13	11 7/8	- 3/8	-3.0
A	CALCCMP	3- 5	4 3/8	+1 1/4	+40.0
O	CAMBRIDGE MEMORIES	1- 4	2 5/8	- 1/8	-A.A
N	CENTRONICS DATA CORP	16- 30	19 1/8	- 1/4	-1.2
O	CCGNITRONICS	1- 1	7/8	0	0.0
O	CCMPUTER COMMUN.	5- 8	A 1/2	- 1/A	-3.7
O	COMPUTER CCNSOLES	4- 7	4	0	0.0
A	COMPUTER EQUIPMENT	2- 4	3 7/8	- 1/4	-A.0
O	CCMPUTER TRANSCEIVER	1- 1	1 3/5	+ 1/8	+10.0
C	CCNTEN	9- 13	12 1/8	- 1/8	-1.0
N	CCNRAC CORP	19- 28	19 3/4	+ 3/8	+1.9

E R C H		PRICE			
		1977-78 RANGE (1)	CLOSE MAR 1 1978	WEEK NET CHNGE	WEEK PCT CHNGE
O	DATA ACCESS SYSTEPS	4- 5	4	+ 1/2	+14.2
O	DATA 100	A- 11	10 1/8	+ 3/R	+3.8
A	CATA PRCDUCTS CORP	9- 19	15	- 3/8	-2.4
O	CATA TECHNOLOGY	3- 4	4	0	0.0
O	CATUM INC	1- 3	2 3/4	+ 1/4	+10.0
O	CECISION CATA CONPUT	2- 3	1 7/8	- 1/8	-A.2
O	CELTA DATA SYSTEMS	1- 1	3/8	0	0.0
A	COCUPATION INC	A- 12	11	- 1/2	-4.3
O	DATARAM CORP	2- 24	18 1/4	+1 1/2	+8.9
N	ELECTRONIC M C M	4- 5	4 3/8	+ 3/8	+9.3
O	FABRI-TEK	1- 2	1 1/8	0	0.0
O	GENERAL CCMPUTER SYS	0- 2	1 1/2	+ 1/4	+20.0
N	HAZELTINE CORP	8- 12	10 3/4	0	0.0
N	HARRIS CORP	28- 47	43 3/8	+1 1/8	+2.6
O	INFOREX INC	4- 8	7 5/8	0	0.0
O	INFORMATION INTL INC	8- 14	7 1/2	- 1/2	-A.2
O	INTEL CORP	38- 57	39 1/2	0	0.0
A	LUNDY ELECTRONICS	3- 8	4 3/4	0	0.0
O	PSI DATA CORP	8- 15	12 7/8	+ 3/8	+3.0
O	MEMOREX	23- 34	27 1/4	- 5/8	-2.2
N	POHAWK CATA SCI	5- 8	7 1/2	+ 1/4	+3.4
O	PENRIL CORP	2- A	5	0	0.0
N	PERTEC CORP	7- 11	9 1/4	- 5/8	-A.3
A	PCTTER INSTRUMENT	2- 2	1 3/A	0	0.0
O	PRECISION INST.	2- 2	2	0	0.0
O	QUANTOR CORP	3- 5	3 3/8	- 3/8	-10.0
O	RECCGNITION EQUIP	6- 10	7 1/8	- 5/8	-8.0
O	SCAN DATA	1- 2	1 1/4	+ 1/8	+11.1
O	STORAGE TECHNOLOGY	10- 28	24 1/2	- 3/4	-2.9
O	T BAR INC	7- 15	14 3/4	+ 1/8	+0.8
O	TALLY CORP.	4- 8	7 1/8	+ 3/4	+11.7
A	TEC INC	8- 10	6 1/4	- 1/8	-1.9
N	TEKTRONIX INC	29- 40	53 5/8	- 3/8	-1.1
N	TELEX	2- 4	3 1/4	- 1/8	-3.7
O	TESDATA SYSTEMS CP	13- 20	14	- 1/4	-1.7
O	WILTEK INC	1- 1	1/2	0	0.0
	SUPPLIES C ACCESSORIES				
A	AMERICAN BUS PRODS	6- 8	7 1/8	0	0.0
O	BALTIMORE BUS FORMS	1- 4	2 1/4	+ 1/4	+12.5
A	BARRY WRIGHT	10- 19	1A 5/8	- 3/4	-4.3
O	CYBERMATICS INC	1- 1	7/8	0	0.0
O	DUPLEX PRODUCTS INC	14- 20	19 1/8	+ 1/4	+1.3
N	ENNIS BUS. FORMS	A- 10	10 1/4	+1 1/4	+13.8
O	GRAPHIC CONTROLS	13- 39	39	0	0.0
N	SN COMPANY	A5- 5A	45	- 3/4	-1.8
O	MOORE CORP LTD	24- 37	29	+ 1/4	+0.8
N	NASHUA CORP	1A- 28	22 5/8	+1 1/4	+5.8
O	STANDARD REGISTER	18- 25	21 1/2	0	0.0
O	TAB PRODUCTS CO	8- 19	7 3/4	- 1/8	-1.5
N	UARCO	18- 22	21 1/8	0	0.0
A	WABASH MAGNETICS	10- 15	10 1/4	-1	-8.8
N	WALLACE BUS FORMS	17- 21	18 5/8	- 1/A	-1.3

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